CONSTRUCTING AMERICAN DIESEL ENGINES

NEW YORK SEATTLE

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# MOTORSHIP

*Devoted to Commercial and Naval Motor Vessels*

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DIESEL MARINE ENGINES
FOR ALL CLASSES OF SHIPS

McINTOSH & SEYMOUR CORP.
AUBURN, N.Y.U.S.A.

FORTHCOMING ARTICLE RACE FOR SUBMARINE POWER

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*EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.*

# MOTORSHIP

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*PROFUSELY illustrated with photographic reproductions of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.*

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# Building American Diesel-Engines

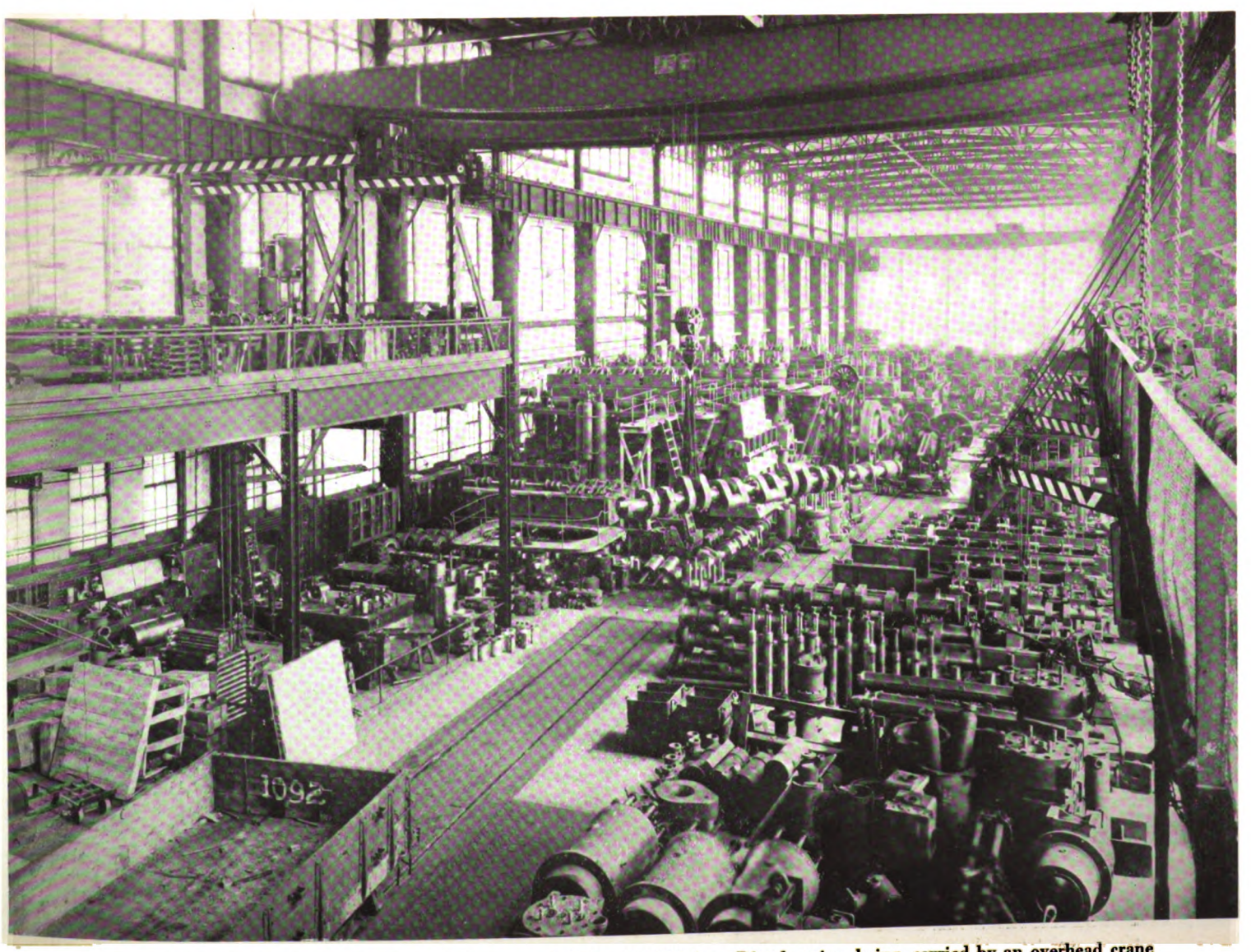
## *The McIntosh & Seymour Plant at Auburn, N. Y., Where Oil-Engines for Twenty-five Successful Merchant-Ships Have Been Turned-Out*

HAVING constructed more merchant-marine type Diesel-engines than any other American concern, the old-established firm of McIntosh & Seymour of Auburn, N. Y., hold a position of considerable importance and responsibility in the front ranks of domestic marine-engineering concerns, and their name is as well-known in motorshipping circles as any of the big European Diesel-builders. At the back of their reputation of recent years is their former repute as constructors of steam-engines. Their success in oil-engine manufacture is partly due to a proper recognition of the true importance of the application of sound engineering principles to both design and construction adequately supported by good business methods, also to a measure due to an adherence to bold and continuous publicity on a scale commensurate with their manufacturing facilities. The result of the combination of these logical principles is to be found in the number of installations in operation to-day.

McIntosh & Seymour hold the position of having secured the largest single order for merchant-marine type Diesel-engines ever placed at one time with any firm in the world, namely for 52 engines of 1,200 indicated h.p. each by the U. S. Shipping Board in 1918, which record contract was afterwards reduced by fifty per cent, owing to the termination of the war, but still leaving an order of great importance. All of these Diesels have since been completed, several of which are in successful service, including the American motorships "Kennecott," "Bayonne," "Bramell Point," "Astmahco III" and "Astmahco IV," while for some mysterious reason the others are still in storage at Hog Island and elsewhere and have not been publicly offered for sale by the Board.

The firm was founded by John E. McIntosh and James A. Seymour in 1885 under the name of McIntosh & Seymour. At the start, high-speed stationary steam-engines were built, and due to the excellence of the service given by these engines, the business was a success from the start and the firm grew rapidly until steam-engines of all types were built in sizes up to ten thousand horsepower.

In the year 1913, due to the tremendous possibilities and advantages of the Diesel-oil-engine to them and to all far-sighted engineers, arrangements were made with the Aktiebolaget Diesels Motorer of Stockholm, Sweden (Now the A/B Atlas Diesels Motorer), to build this type of engine from their designs at the McIntosh & Seymour plant at Auburn, New York, embodying certain mechanical features which American-engine practice demands. It is not widely known that this Swedish concern was the first company ever organized for the sole purpose of building Diesel-engines, and during the twenty-one




**Erecting-shops at Auburn, showing an 18-ton crankshaft of 1,200 h.p. Diesel-engine being carried by an overhead crane**

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**General view of McIntosh & Seymour plant at Auburn, N. Y.**

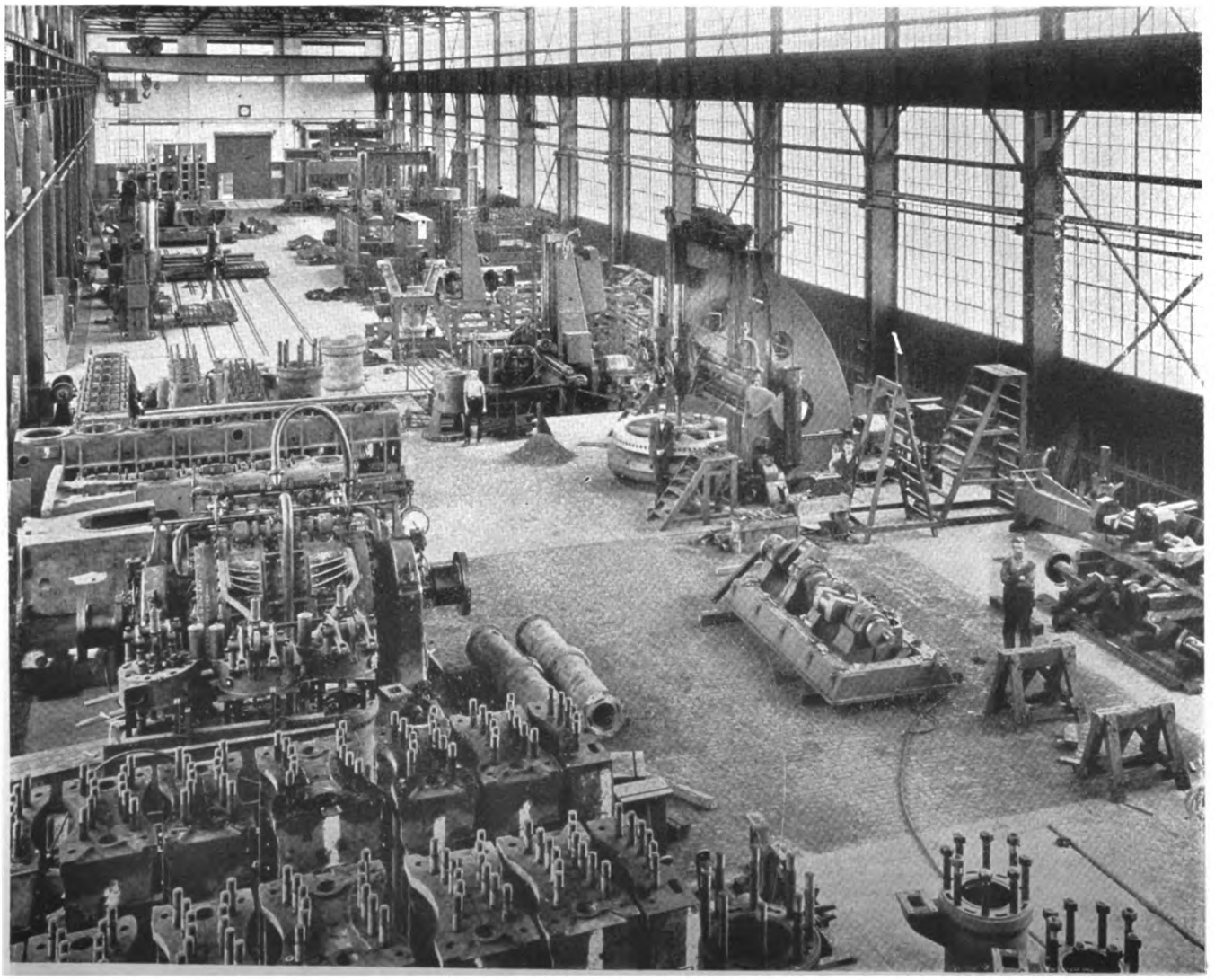
years of their activities they have developed a Diesel-engine which has given especially satisfactory service in use under actual conditions. It was this Stockholm firm that in 1902-1903 built the three Nobel-designed four-cycle type 120 b.h.p. Diesel engines of the tanker "Wandal," which are still in successful service in Russia.

Their geographical location enabled them to realize at an early date the many advantages of the Diesel-engine for marine use, and they were among the first to take up this manufacture, in which they have been so remarkably successful, and are said to be the first to build a directly-reversible marine oil-engine for use in a seagoing vessel, although some authorities give this title to their friends, the Nobel Co. of Russia.

James A. Seymour, one of the founders of the McIntosh & Seymour business and who is now Consulting Engineer, is also Chairman of the Board of Directors of this American company. The president of the present corporation is Alfred E. Ballin.

When the possibilities of the Diesel-engine became apparent to the McIntosh & Seymour organization, a careful investigation was made as to just what had been accomplished by makers of this type of oil-engines throughout the world, and as a result of this investigation license arrangements were made with the Aktiebolaget Diesels Motorer, so that their type of engine could be advantageously built at the Auburn plant. Due to the excellent designs resulting from the Swedish plant's extensive Diesel-engine experience, the free interchange of ideas made possible by the close working arrangements affected, the McIntosh & Seymour Company's experience in a similar line of manufacture. To date over 150,000 brake horsepower of highly successful Diesel-engines have been rapidly and effectively produced by the Auburn plant.

After a careful investigation of both the two-cycle and the four-cycle type of Diesel-engines as to their commercial success in actual use at sea, it was the unanimous decision to build only slow-speed, four-cycle engines for sea-going cargo-ships, and moderate-speed engines for smaller craft and engine room auxiliaries at the Auburn plant. There are now twenty-five American built ships of nearly 90,000 tons deadweight in actual service equipped with propelling-engines built by



**Heavy machine-shop, showing big milling machine in foreground**

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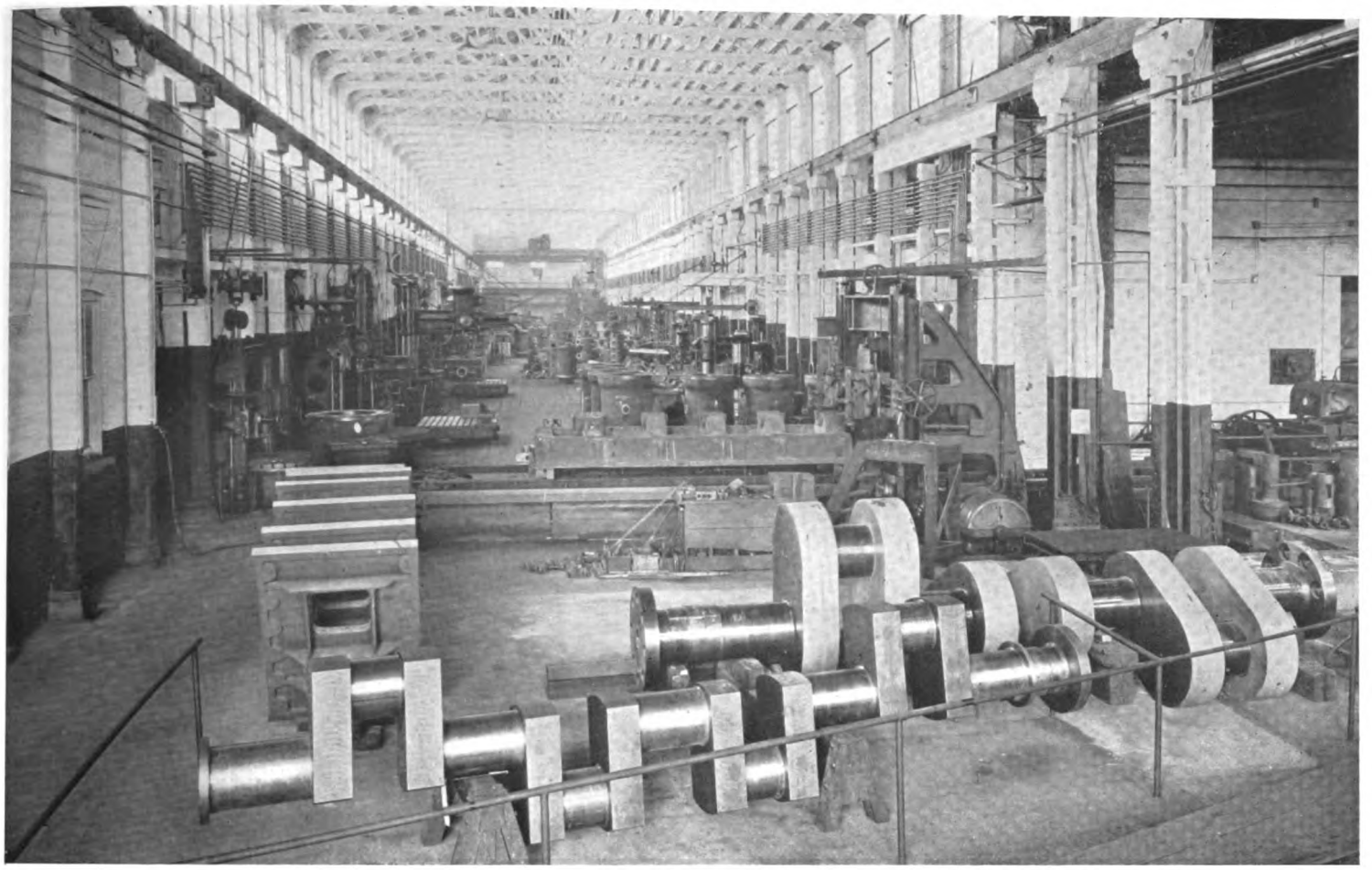

Machine-shop for moderate-weight castings

the McIntosh & Seymour Corporation, and the operating results of all of them can be pointed to with a proper pride.

The McIntosh & Seymour plant covers about twenty acres, the railroad tracks on the property connecting with the New York Central on the one side and with the Lehigh Valley Railroad on the other, with the various buildings so arranged that the raw materials which are taken in at one end of the plant pass through the buildings in their proper sequence, the finished parts going from the two machine-shops into the erecting-shop. After being erected and tested the finished equipments are taken down and packed for shipment, and go out at the other end of the works from where the raw material came in, an arrangement which permits the minimum

View of the McIntosh & Seymour foundry

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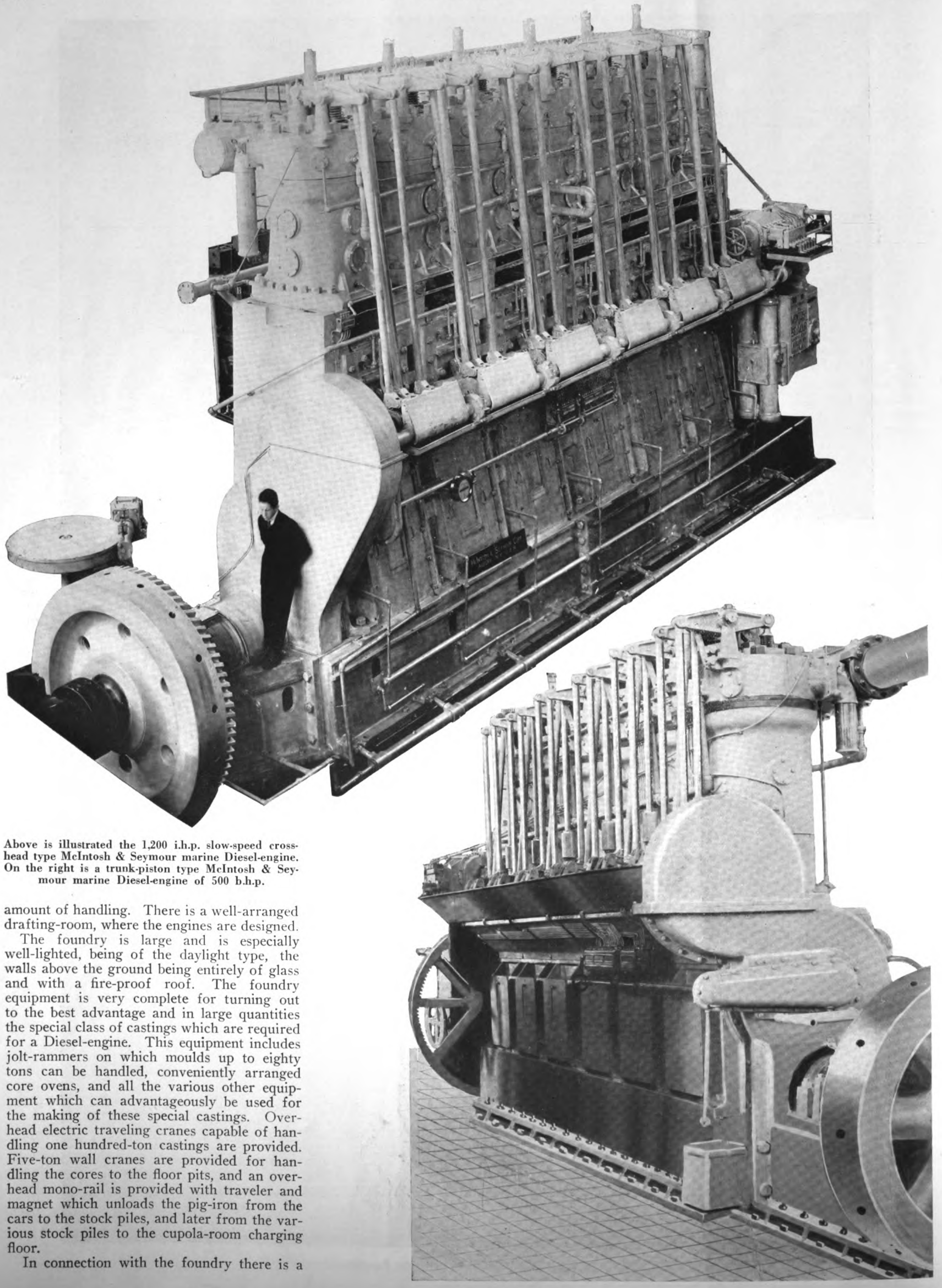

**Above is illustrated the 1,200 i.h.p. slow-speed cross-head type McIntosh & Seymour marine Diesel-engine. On the right is a trunk-piston type McIntosh & Seymour marine Diesel-engine of 500 b.h.p.**

amount of handling. There is a well-arranged drafting-room, where the engines are designed.

The foundry is large and is especially well-lighted, being of the daylight type, the walls above the ground being entirely of glass and with a fire-proof roof. The foundry equipment is very complete for turning out to the best advantage and in large quantities the special class of castings which are required for a Diesel-engine. This equipment includes jolt-rammers on which moulds up to eighty tons can be handled, conveniently arranged core ovens, and all the various other equipment which can advantageously be used for the making of these special castings. Overhead electric traveling cranes capable of handling one hundred-ton castings are provided. Five-ton wall cranes are provided for handling the cores to the floor pits, and an overhead mono-rail is provided with traveler and magnet which unloads the pig-iron from the cars to the stock piles, and later from the various stock piles to the cupola-room charging floor.

In connection with the foundry there is a

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large, well-arranged pattern storage-building, so laid out that any pattern can be at once located from a card-index file. In connection with the pattern storage is a well-equipped pattern shop.

Also, in connection with the foundry, is a thoroughly equipped chemical laboratory with physical testing plant which controls not only the output of the foundry but also of the various raw materials which come into the plant.

There are two machine shops, one arranged for heavy work and the other for light work. Each shop is completely equipped with the latest type of special tools for machining accurately and advantageously the various parts of a Diesel-engine.

The heavy machine-shop, the interior of which is very clearly shown in the illustration, is of the daylight type, the walls being of glass from the ground up and having a fire-proof roof. In this shop are located the various latest tools for machining the heaviest parts.

In the end of the shop next to the foundry is located a 16-foot planer which can plane—in one chucking—all columns of a 4,000 horse-power Diesel-engine. In fact, another illustration above shows this planer planing the columns for a 2,000 I.H.P. marine Diesel-engine that is now nearing completion at Auburn. This engine has six cylinders of 28-inch bore by 48-inch stroke and will develop 1,525 shaft h.p. at 105 r.p.m. It will weigh 361 tons and will be 47½ feet long.

The parts, after they have been planed, pass on to the drills, which are especially well arranged, machined rails being set in the floor on which various portable tables are used, so that a piece when once chucked on one of these tables can pass in front of a horizontal spindle-drill so that all of the holes in that side of the casting can be drilled and tapped and then pass on to radial-drills with ten-foot arms. With this arrangement the drilling of the parts can be done with minimum handling by the shop crane.

From the drills the bases pass on to the horizontal-spindle boring-mills, where by means of long special boring-bars and fixtures the bearing-seatings for a whole base are bored all at one chucking, so that the bearing-seatings are absolutely in line one with the other.

The erecting-shop is located across the end of the two machine-shops. It is arranged with well-lighted galleries where the smaller parts that go to make up the engines are assembled, being taken by the crane from these galleries direct to the engines as they are being erected. The illustration given shows the interior of this shop very plainly, and there can be noted hanging in the cranes a built-up crankshaft for a 1,200 h.p. Diesel-engine, which weighs eighteen tons.

The testing-floor is arranged with stands for nineteen engines, slots being provided so that the engines can be bolted to the test-bed at any place. Trenches and tunnels are provided in which is complete water-service for furnishing and carrying away jacket-water for an engine located anywhere on the test-bed, and also for furnishing and taking away the cooling-water from the Heenan-Froude testing-brakes, or dynamometers, as they are called, four of which are available for testing various sized engines, the largest brake having a capacity up to 5,000 brake horse-power.

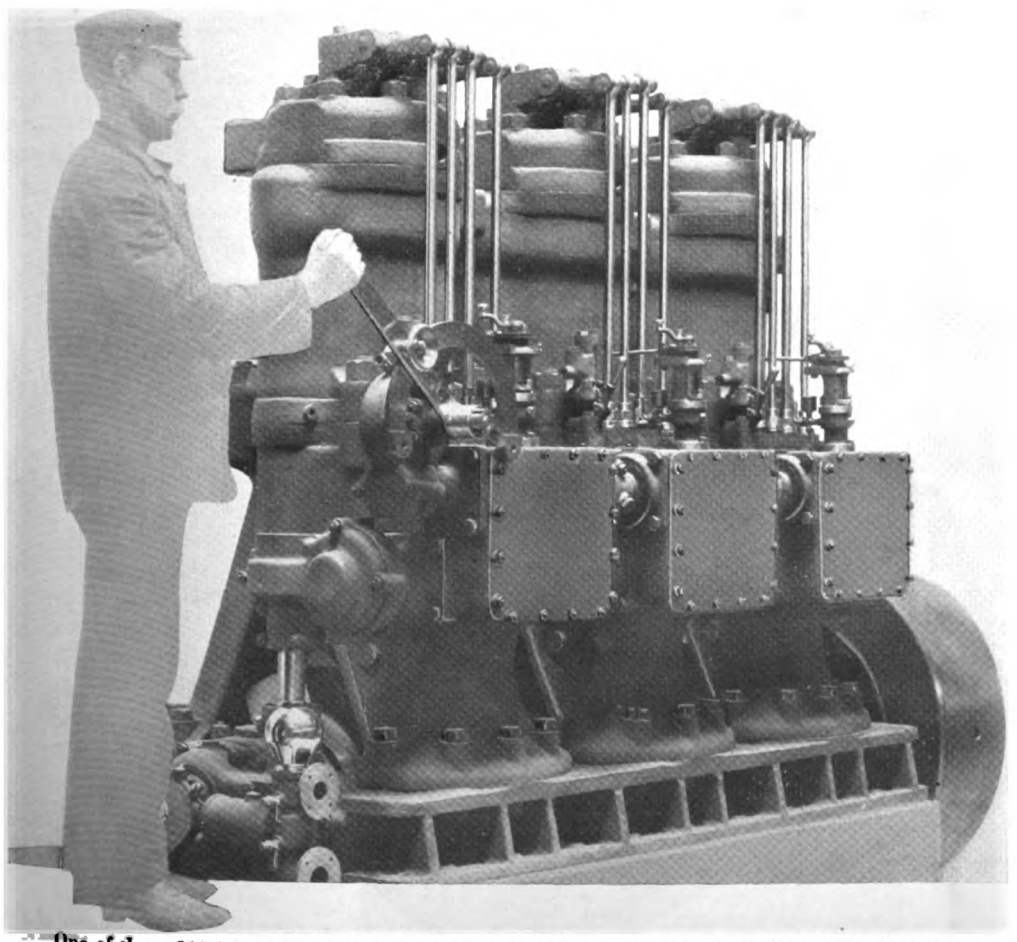
The far end of this erecting-shop is arranged for a shipping-room, and the parts of the engines as they are being disassembled are taken over to the shipping platform, prepared for shipment, boxed, put on cars and pass out at the far end of this shop. Some idea of the size of this erecting-room can be had from a comparison with the size of engines under erection and the freight-car in the foreground.

# Five Veteran Passenger Motorships

**Unpublished Details of a Russian Diesel-Ship Fleet**

In the past Diesel engines and motorships have been built and placed in service without any public record. Not even Lloyds contains any reference to some of the large motor-craft now in service. This particularly applies to many of the big Diesel-driven ships built in Russia prior to the war. Until published in "Motorship," no details have ever been issued regarding a fleet of passenger-cargo vessels built by the old Russian government for their own account and at their yard at Wotkinsky, which is on the river Kama south of Perm City. Five sister ships were built, and Diesel engines were installed under the supervision of John Weyland, a Swedish engineer of Stockholm, who designed the engines in question. These ships are of the shallow-draft type and have the following dimensions:

| | |
|---|---|
| Displacement (F. W.) | 1,915 tons |
| Length | 280 ft. |
| Breadth | 42 ft. |
| Depth | 7 ft., 6 in. |
| Power | 300 b.h.p. |
| No. of screws | triple |



**One of three 100 b.h.p. Weyland Diesel-engines of the motorship "Timiriaseff." The ship was illustrated on page 962 of the Dec., 1921, issue of *Motorship***

One of these motorships, the "Timiriaseff," was illustrated in our December 1921 issue. Her three Weyland Diesel engines each develop 100 H.P. from four cylinders on the four-cycle principle. We understand from the designer that Diesel engines with the Weyland manoeuvring mechanism have been built by Korting Bros. of Hanover, Germany, by Schneider et Cie. of Le Creusot and Sir William Armstrong, Whitworth & Co., of Newcastle-on-Tyne.

### HARLAND & WOLFF'S MOTORSHIP OUTPUT

The tonnage launched by Harland & Wolff, Ltd., during 1921, is smaller than usual, and does not represent the firm's total output for the year, as their general shipbuilding program was considerably curtailed through suspensions and also by the concentration of almost their entire forces on the reconditioning of steamers.

During the year 1921 they completed several notable Diesel-driven vessels; the twin-screw motor-vessel "Somersetshire" for the Bibby Line; and at Glasgow and Greenock the twin-screw motorships "Losada" and "Lobos" for the Pacific Steam Navigation Company, the last three representing the latest and most successful type of motor-vessels with engines constructed by them on the well-known Burmeister & Wain Diesel system. This design of engine was also fitted by them in the freighters "Dinteldyk," "Lochkatrine," "Linnell" and "Lassell."

Perhaps the most interesting vessel that passed through their hands during the year was the twin-screw motorship "Aba," for the West African trade of Elder Dempster & Co., Ltd., which has the distinction of being the first large passenger vessel equipped with Internal-Combustion engine. The above motorships represent nearly 100,000 tons deadweight.

### GROWTH OF SHIPS BUILT ON THE ISHERWOOD SYSTEM

From Sept. 1907 to Dec. 1908 only six ships of 31,608 tons d. w. were built to the Isherwood system. The next year this had increased to thirty-six ships. In 1921 there were no fewer than 1,418 ships of 12,032,400 tons dw. built to the Isherwood system. About forty of these vessels are Diesel-driven.

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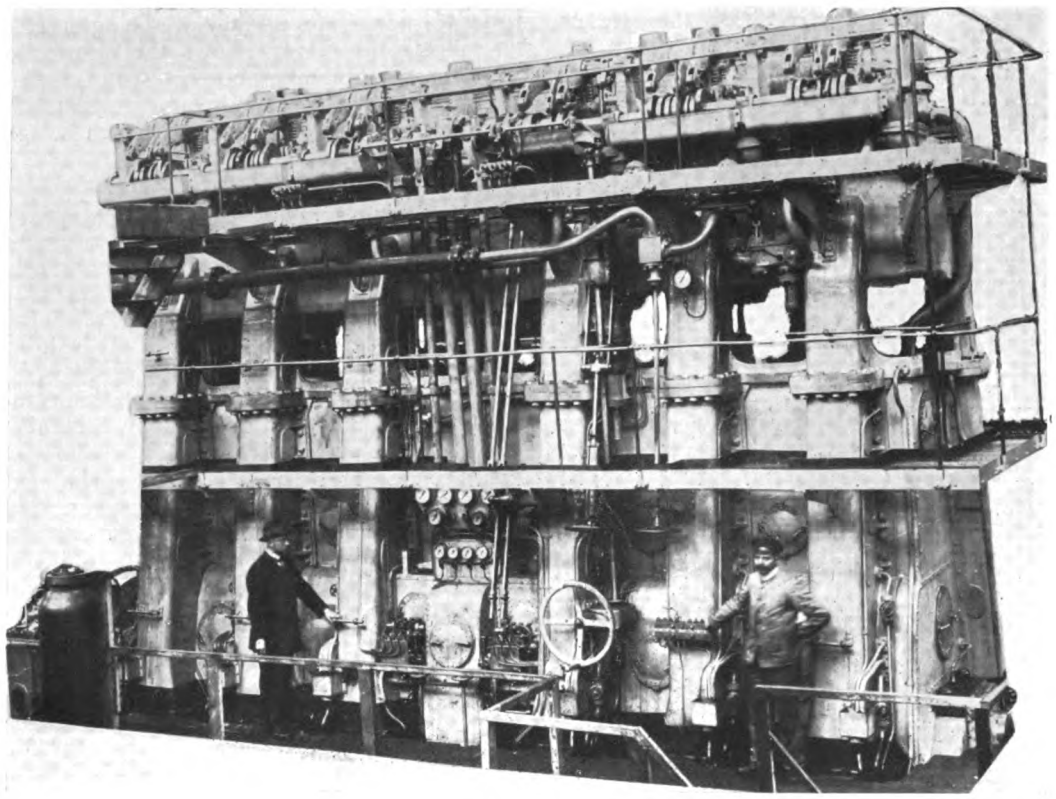
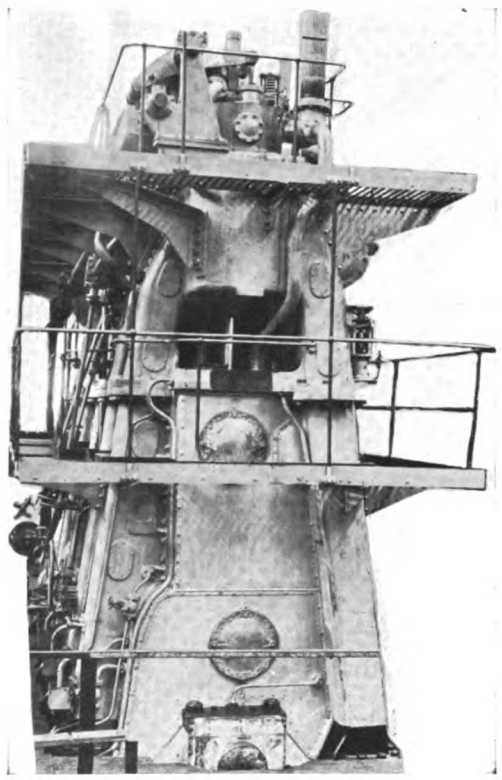




The new Deutsche Werke 950 shaft-horsepower Diesel marine-engine

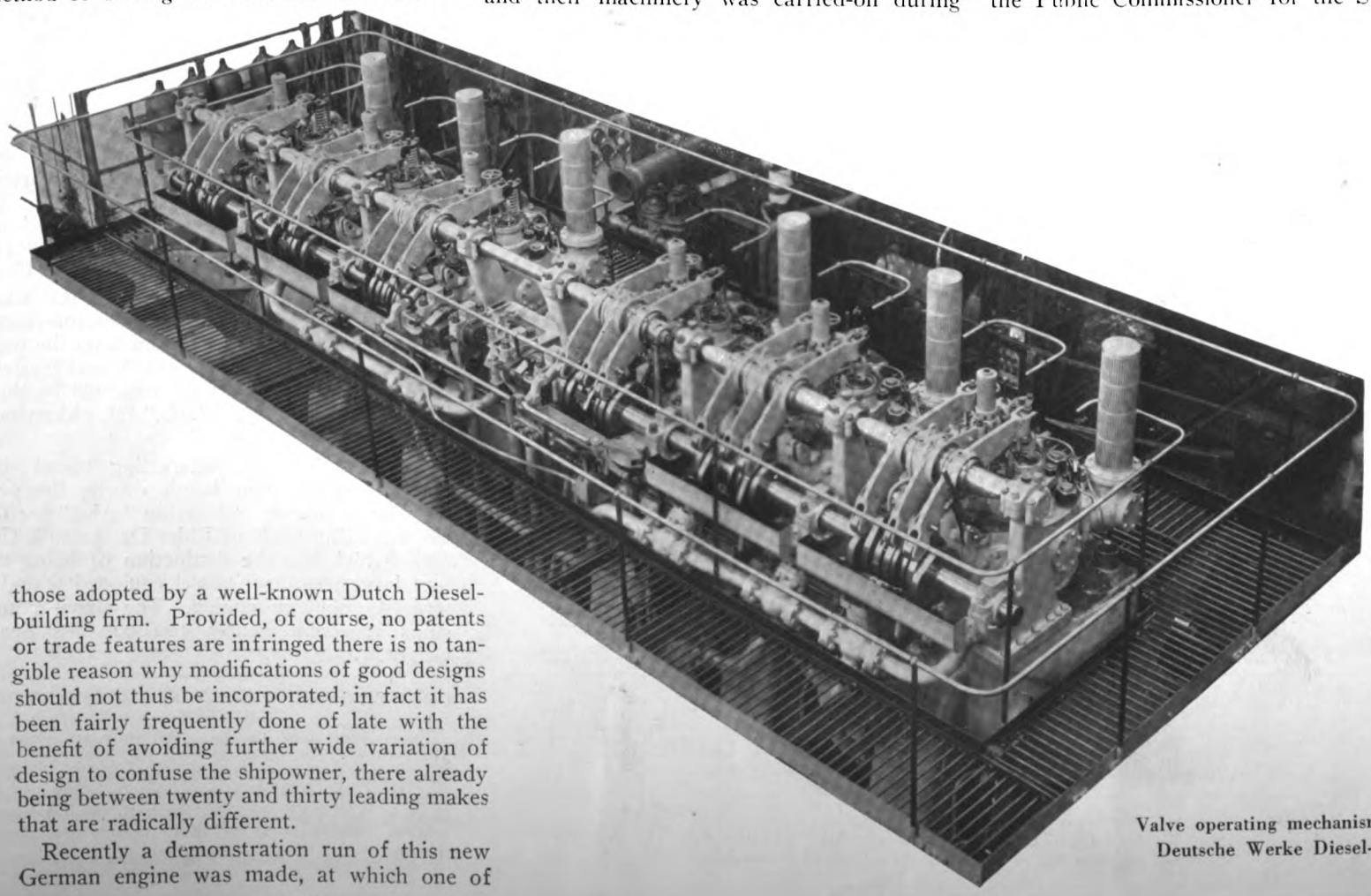
# Demonstration of the Deutsche Werke Engine

## *New 950 Shaft-Horsepower Diesel Marine-Engine Is Exhibited Shortly After Completing Seven-Days Non-Stop Run*

WHILE at the first glance the new Deutsche Werke Diesel-engine appears to be distinctive in design, after careful study it reveals itself to be the combination of the good features of a number of marine-engines of existing makes, together with the incorporation of modern recognized steam-engine practice, and a certain proportion of original thought. For instance, the cast-iron columns that carry the cylinder-beam are along lines of regular steam practice, while the cylinder-beam casting itself, and the method of driving the camshaft is similar to those adopted by a well-known Dutch Diesel-building firm. Provided, of course, no patents or trade features are infringed there is no tangible reason why modifications of good designs should not thus be incorporated, in fact it has been fairly frequently done of late with the benefit of avoiding further wide variation of design to confuse the shipowner, there already being between twenty and thirty leading makes that are radically different.

Recently a demonstration run of this new German engine was made, at which one of our European correspondents was present through the courtesy of the Deutsche Werke of Kiel. It will be recollected that this shipyard and engineering works was the old Imperial Yard, where among other work the overhauling and maintenance of submarines and their machinery was carried-on during the war. One of the objects of the German Government in furnishing the entire 100 million marks capital of the company was to keep occupied the well-trained staff of workmen as well as the well-equipped yard.

The new Deutsche Werke Diesel-engine, which has previously been illustrated in MOTORSHIP, has been designed by Dr. Rembold, who was formerly with Krupp's Germaniawerft at Kiel. It is to be installed, together with a duplicate engine, in a tanker of 8,000 tons deadweight building to the order of the Public Commissioner for the Surrender-



Valve operating mechanism of the Deutsche Werke Diesel-engine

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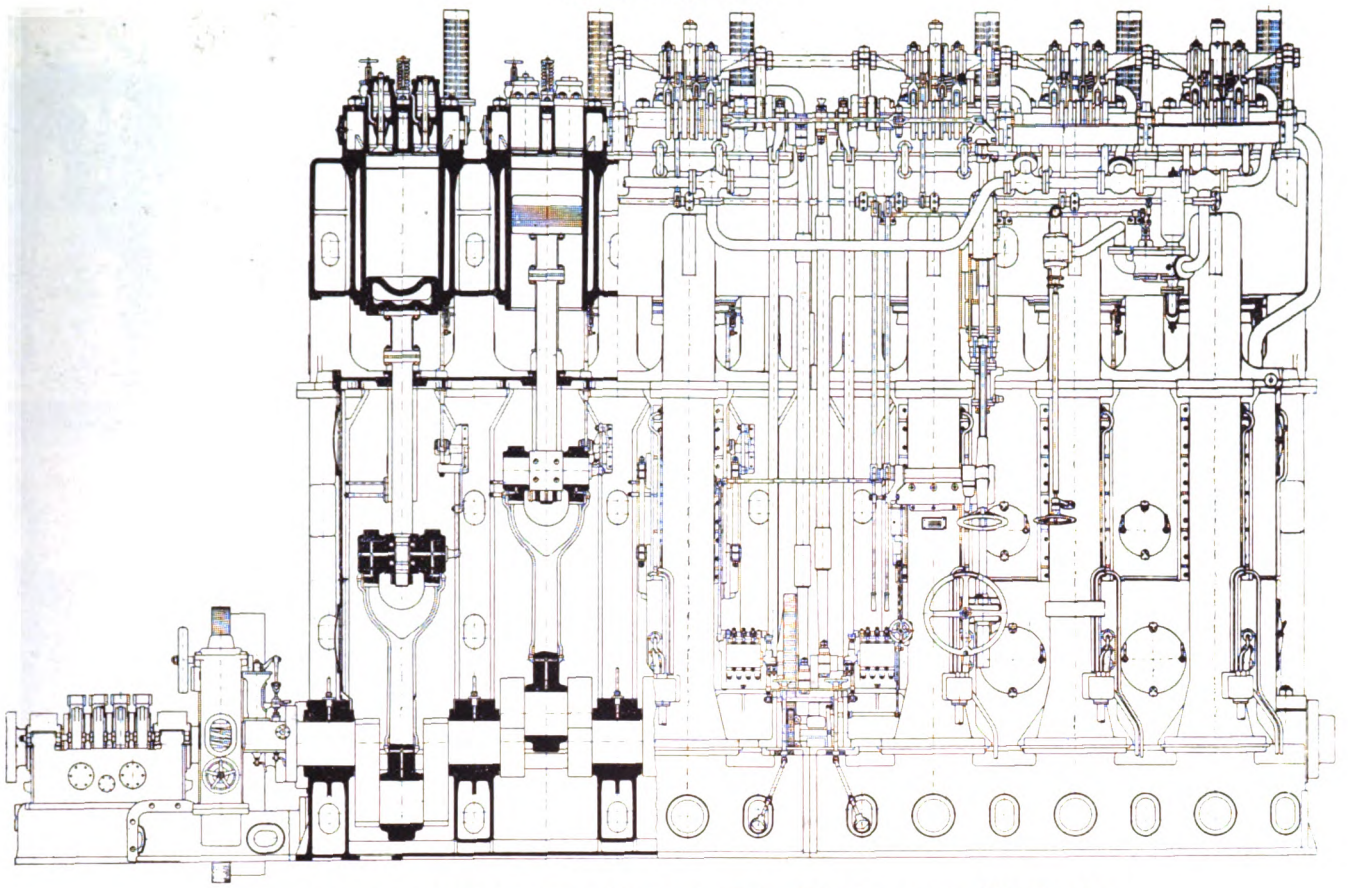
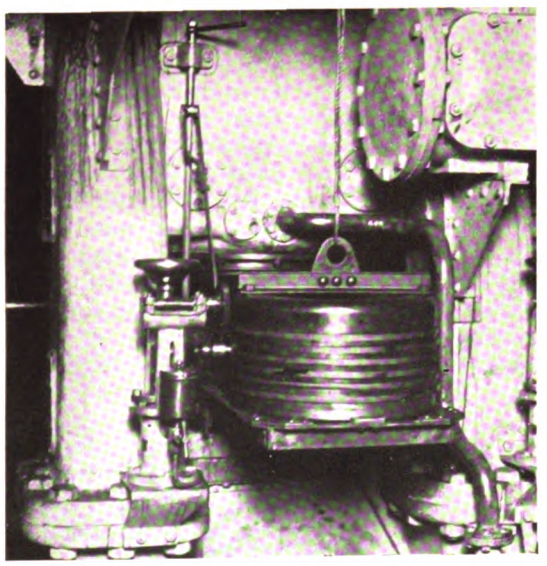


**General arrangement and sections of Deutsche Werke 950 b.h.p. marine Diesel-engine**

ing of Docks and Ships for turning-over to Italy when completed next November. Work had been started on this first engine prior to the hull being ordered, and six months ago the seven-days test was run in the presence of the Government's survey committee, as well as before officials of the German Lloyd, with which society the vessel and engine will be classed.

As is obvious from the illustrations the engine is of the four-cycle, crosshead, single-acting type, and is direct reversible. There are six working-cylinders 19.685″ bore by 35.433″ stroke turning at 135 r.p.m. At this speed it develops 950 shaft-horsepower or 1,280 indicated horsepower, with a mean-effective pressure of 70.39 lbs. and a mean-indicated pressure of 95 lbs., the air-blast pressure for the fuel-injection being 823 lbs. per sq. inch. The mean temperature of the exhaust-gases is 300 degrees Centigrade. With an air-tank holding 2.2 cubic meters of air at 800 lbs. pressure, 27 reversing maneuvres were carried out. The engine was connected to a water-brake of the Deutsche Werke's own manufacture.

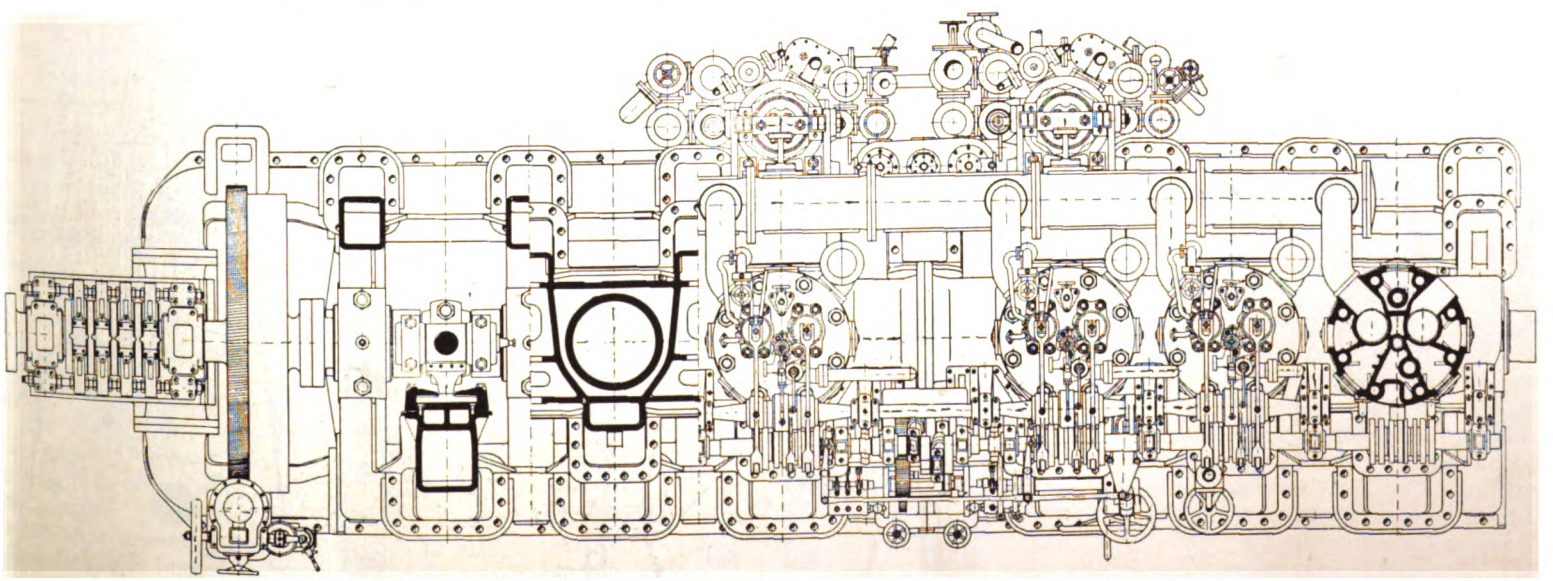
Similarly to several other designs of Diesel-engines recently introduced to the marine market the Deutsche Werke cylinders are cast *en bloc*, each set of three cylinders forming a box-casting with a distance-piece casting between bolting the two together, the whole forming a rigid beam, thus giving lateral rigidity and strength. In the box-castings the cylinders are pressed into position, but the cylinder-heads are detachable, although there seems to be no particular reason for making the heads removable because special arrangements have been made to take-out the piston from below, and had the head and liner been cast in one piece better cooling around the combustion chamber could have been effected. But some designers object to the one-piece head-and-liner arrangement on the grounds that the replacement is more difficult and more expensive if either a head or liner has to be replaced. This view probably had considerable weight with Dr. Rembold.



**Removing the piston from the space between the cylinder-block and entablature**

On the other hand, with more effective cooling at the point of greatest heat and heat strains, the necessity for replacement is not likely to occur so soon—if at all! These and similar matters, of course, are questions of engineering opinions and will be more or less in dispute for many years to come unless something definite can be established.

As there are no steel tie-rods running from



**Plan of Deutsche Werke engine showing arrangement of valves and air-compressors**

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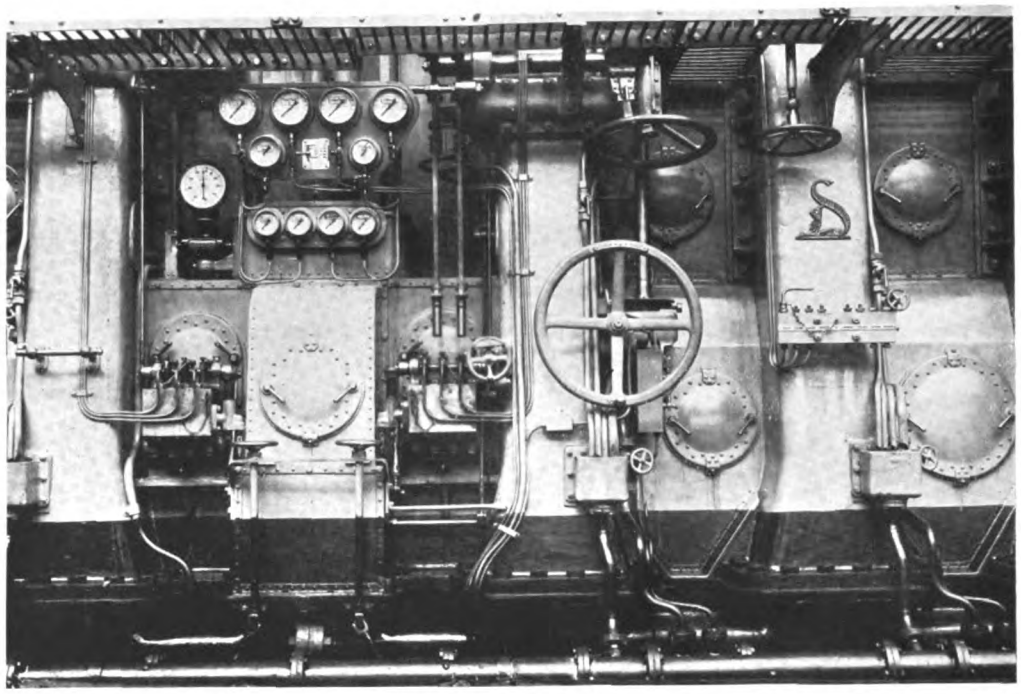
the top of the cylinder-boxes it has been possible to make the cast-iron frames (that carry the same) in two pieces, with the upper section cast integral with the boxes in the form of legs. The lower part of these legs have flanged bases, the main portion of the bases forming an entablature to separate the cylinders from the crank-case and so prevent any water leakage or carbon from dropping into the lubricating oil, on to the main bearings, or on the cross-heads and guides.

In the entablature are stuffing-boxes for the piston-rods. The flanged parts of the legs are mounted on the columns proper, and the columns on the bed-plate respectively. This system of framing has been selected in order that the main-bearings and cam-shaft driving-gear can be easily dismantled or their temperature ascertained during running.

On the front side of the engine and on a level with the cylinder heads the cam-shaft is carried on cast brackets, and the shaft is provided with a double set of cams for ahead and astern movements respectively. When reversing the cam-shaft is moved laterally by a small pneumatic-motor, or by hand if necessary. For operation of the cam-shaft the system of long vertical rods and cranks—first adopted with the Werkspoor Diesel-engine—has been adopted, the lower ends of these rods being driven-off small cranks by a two-to-one reduction-gear off the crank-shaft, which gear is force lubricated.

In the space between the cylinder-box and the entablature the pistons can be removed without disturbing other working parts or piping. The operation is as follows: The gear-drive is turned by means of the pneumatic or steam-operated turning-engine on the fly-wheel until the piston is in the desired position. Next the bolts coupling the piston to the rod are slackened, and the water-cooling telescopic-rods are detached with the piston

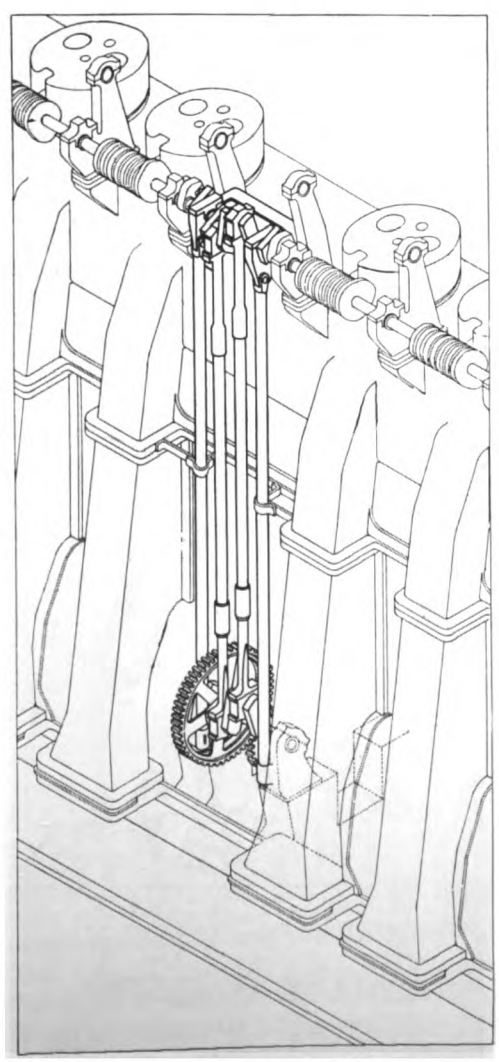


Maneuvering controls of the Deutsche Werke Diesel-engine

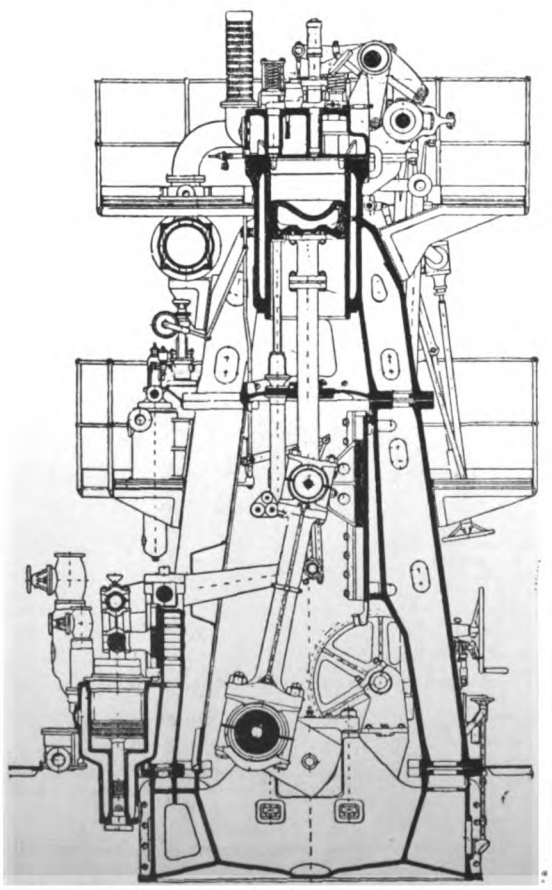
in its top position. Then the piston is lowered to the lower dead-center and supported by means of wooden supports. By turning the engine until the lower flange of the piston-rod touches the piston, the upper section of the rod can be lifted-out. Finally, the wooden supports are removed and the piston is lowered till it rests upon a pair of sliding-guides, when it can be withdrawn laterally.

Thus the designer has cleverly arranged for the dismounting of the pistons from below without utilizing a detachable cylinder extension-piece. But in order to accomplish this it has been necessary to make the piston-rod in two pieces. We are inclined to think that only practical experience under actual working conditions will reveal whether or not this is good engineering practice. To our mind there is a possibility of crystallization taking place in the bolts that couple the flanges of the two sections of the piston-rod, due to the constant pressure-and-relief action.

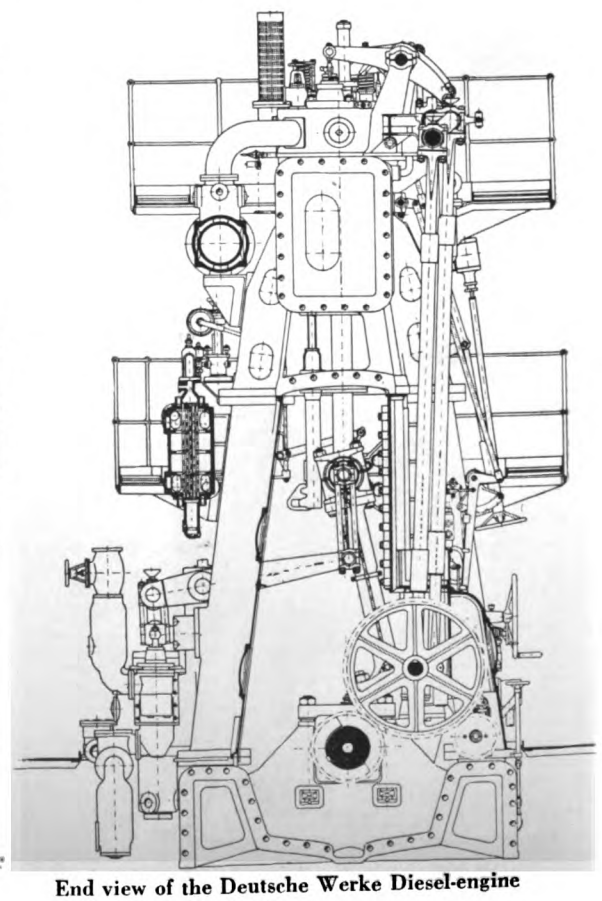
For the purpose of saving space longitudinally two three-stage air-compressors are driven by rocking-levers off the crossheads, and have the high-pressure stage at the bottom. The rocking-levers also serve to drive the cooling-water and oil-pumps. The iron bed-plate is cast in two sections and has square section bearings with white-metal lined brasses similar to regular marine steam practice. The bearing-caps are of mild steel with connections for the force-feed lubrication through the drilled Seimens-Martin crankshaft. This crankshaft also is in two sections which are interchangeable. It is worth noting that the arrangement of cast-iron frames enables the crankshaft to be removed without detaching the frames from either side. Cooling of the pistons as well as the cylinder is by sea-water, the supply to the pistons being through telescopic-tubes without stuffing-boxes. The outlet of the water is a visible flow and can be watched from the operator's platform. Cooling-water is taken by the bilge-pump and turned overboard.



Method of operating camshaft of Deutsche Werke engine similar to Werkspoor design



Section of the Deutsche Werke Diesel-engine



End view of the Deutsche Werke Diesel-engine

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# The Subsidy and The Development of Motor-Vessels

OWING to the specialized nature of this publication we are not so much concerned with the general features of President Harding's proposal for ships' subsidy as we are to the particular sections that affect oil-engined motor-vessels, because the general sections have all been fully discussed and analyzed in the daily press and the shipping papers. One very important feature of the President's proposal is that Section Eleven of the (Jones) Merchant-Marine Act of 1920 shall be amended to read as follows:

"Sec. 11. That the Board may set aside out of the revenues from sales and operations a sum not exceeding $125,000,000, to be known as its Construction Loan Fund.

"The Board may use such fund to the extent required by making loans upon such terms as the Board may prescribe to aid persons, citizens of the United States: (a), in the construction of vessels of *the best and most efficient* type *equipped with the most modern, the most efficient and the most economical machinery,* and commercial appliances, or, (b), in the equipment of vessels already built with machinery and commercial appliances of the type and kind mentioned.

"No loan shall be for a greater sum than two-thirds of the cost of the vessel to be constructed or of the value of the vessel when thus re-equipped, nor shall any loan be made at a rate of interest less than 2 per cent per annum.

This is in line with the recommendations made some time ago by MOTORSHIP with the addition that the loan-fund for this purpose is increased from $25,000,000 per year to $125,000,000. With the exception of powers beyond the present practicability of Diesel-type internal-combustion engines, it is obvious that this loan-fund cannot be used to aid in the construction of new and comparatively uneconomical and inefficient steam-driven ships, but it is clear that the money can be used for the purpose of converting steamers to oil-engine power if the Bill becomes law. With the view of assisting the operation of

### *Net-Tonnage and Net Gross-Tonnage Should Be the Basis of Computation*

American vessels of 1,500 tons gross or more, President Harding proposes that a Subsidy shall be given calculated on the basic rate for each such vessel, regardless of speed, on one-half of one percent of the gross tonnage for each 100 nautical-miles' travel. For vessels of 13 knots or over (when on light draft) there is an ascending scale of subsidy varying from two-tenths of one cent for a vessel of 13 to 14 knots speed, two and one-tenth cents for ships of 23 knots and over.

In selecting gross-tonnage as a basis of computation the principle reason was that the aid extended is to help compensate for the difference in the first cost here and abroad, to bring into being large and high-powered ships. Also that the Administration and Shipping Board wish to encourage ships of high power and large bunker-capacity, the theory being that if the subsidy was based on net-tonnage it would penalize such ships in favor of slow-speed vessels.

With this theory we entirely disagree, and the subsidy should be given on a basis of carrying-capacity and speed. A vessel is built to carry cargo or passengers or both. If she could do without bunkers at all, it would be highly advantageous from an operaters aspect. That, of course, is impossible—but by adopting the most economical form of propulsive power the bunkers can be reduced to a minimum, the speed increased, and the maximum cargo or number of passengers carried.

One of the types of vessels that it is important to develop is combination cargo-and-passenger liner of about 14,000 to 15,000 tons d.w. and 13 to 17 knots speed. Vessels of this type have been gotten-out in Great Britain and Holland without large bunker-capacities. In fact, their bunker capacities do not exceed that of a 10,000 tons 11-knot oil-fired steam-driven freighter. As for instance, the motorships, "Aba," "Dinteldyk," "Glengarry," "Glenogle," "Loch Katrine," etc. The 9,500 tons gross passenger and cargo motorship "Aba" recently made a voyage from Liverpool to West Africa and return with only 700 tons of fuel oil in her double-bottoms, compared with 3,000 tons of coal or 2,200 tons of fuel-oil if steam propelled. She carries 365 passengers and a considerable amount of cargo on a daily fuel consumption of 22 to 24 tons of heavy-oil. The big British passenger-cargo motor-liner "Domela" averages 13½ knots loaded on 17½ tons of fuel-oil per 24 hr. day. So it is highly important that such vessels should be constructed in the United States and subsidy should be made to encourage their development.

DEFINITIONS OF TONNAGE.

*Gross Tonnage*—Gross Tonnage applies to vessels, not cargo, and is determined by dividing the contents in cubic feet of the vessel's closed-in space by 100.

*Net Tonnage*—Net Tonnage expresses the space available for passengers and cargo, and is determined by subtracting crew, machinery, and fuel tonnage space from the gross tonnage.

The above definitions make it clear why it will be advantageous to base the subsidy on net-tonnage, and thus ensure the most efficient type of ships being built in the future. However, the net-tonnage is by no means the ideal one upon which to base subsidy; but it is the best at present available and certainly much more satisfactory than gross-tonnage. But if the net-tonnage be used it is obvious that the subsidy rates per ton, as quoted by President Harding, should be slightly increased in order to allow for the lower tonnage figures of the net compared with the gross.

**MOTOR PASSENGER-LINER'S MAIDEN VOYAGE**

"Domala," the new twin screw Diesel-driven passenger-liner of the British India Steam Navigation Co., made her maiden-voyage from London to Bombay via the Suez Canal in under 28 days, arriving practically on the scheduled hour. At 13½ knots the daily fuel-consumption did not exceed 17 tons of oil.

**PROBLEMS OF MARINE DIESEL-ENGINE DESIGN**

Under the above title an interesting paper was read before the North East Coast Institution of Shipbuilders and Engineers, by P. Belyavin, who for many years was connected with the design and construction of Diesel-engines in Russia. Mr. Belyavin stated that the failure of the early two-stroke cycle marine Diesel-engine was chiefly due to too little knowledge of the difficulties of its design. Therefore, four-stroke cycle engines for several years were the only engines successfully built. At present the difficulties of the two-stroke cycle engine are more carefully studied and better known, so this type can be built just as reliable as a four-stroke cycle one.

The great advantages of the two-stroke cycle engine are its simplicity, light weight, and size. But to achieve the above advantages it must be correctly designed. Some problems of its design were discussed, and some comparisons of four-cycle with two-cycle engines and steam-engines were given. The Author's conclusion is that the plain single-acting two-cycle engine, if correctly designed, is the nearest approaching the steam-engine in size, and in future is bound to win.

**THE GOLDEN GATE DIESEL-ELECTRIC FERRY**

We are enabled to publish on another page drawings of the first of the two ferries for the Golden Gate Ferry Company of San Francisco, the order for which was referred to in our March issue. The engines now being constructed for the first ferry are two Werkspoor Diesel-engines, each with six cylinders, 389 mm. bore (14.960") by 600 mm. stroke (23.622"), developing 525 brake horsepower at 225 R.P.M. They are being built by the Pacific Diesel Engine Company of Oakland, Cal. The General Electric Company is furnishing two 360 K.W. 250 volt generators, and one 750 b.h.p. 500-volt generator; also two 35 K.W. exciting generators. It is expected that the contract for the second motor ferry-vessel will be placed by the time this appears in print.

**PERFORMANCE OF THE WERKSPOOR MOTORSHIP "TOSCA"**

Discussing the operation of the new Norwegian-owned motorship "Tosca," which has now been in service for sixteen months, Captain P. Sverre Selbach told our correspondent at Bellingham, Wash., that there was not a single stop for engine trouble, nor was one hour lost for repairs during that period since she was launched at Amsterdam. Also that she holds the record for low fuel-consumption. This Diesel-driven freighter, it may be remembered, was described and illustrated on page 32 of our issue of Jauary, 1921, and has the following dimensions:

| | |
|---|---|
| Displacement (loaded) | 10,260 metric-tons |
| Deadweight capacity | 6,990 metric-tons |
| Length (o.a.) | 391 ft. |
| Length (b.p.) | 375 ft. |
| Breadth | 51 ft. 3 in. |
| Depth to main deck | 25 ft. 6 in. |
| Depth to upper deck | 34 ft. |
| Mean draft | 23 ft. 1 in. |
| Gross tonnage | 5,128.49 tons |
| Net tonnage | 3,129.10 tons |
| Engine-power | 2,200 shaft h.p. (3,000 i.h.p.) |
| Diameter of cylinders | 22.047 in. |
| Piston-stroke | 43.307 in. |
| Engine-speed | 125 revs. per min. |
| Propellers | 11 ft. 9¾ dia. by 10 ft. 2 in. pitch and 3.6 m. proj'd area |
| Ship's speed (loaded to 25 ft. 1 in.) | 11 knots |
| Register | Norwegian Veritas |

She is propelled by twin Werkspoor Diesel-engines of 1,500 i.h.p. each, which give her a speed of 11 knots when loaded to 25' 1" draft. She reached Bellingham via the Panama Canal from her home port, Christiania, with a full cargo and discharged at Los Angeles, San Francisco and Seattle. The cargo of lumber was made up at Bellingham and at Everett when she proceeded to Japan.

She is owned by Winge & Co., Christiania, who also own the Werkspoor Diesel motorships "Geisha" and "Indra." In addition to the two main engines in the "Tosca" there are three Werkspoor four-cycle type two-cylinder Diesel-engines, each coupled to a 50 K.W. 220 volt generator for operating the cargo. We regret Captain Selbach did not give the fuel-consumption of the "Tosca," although he stated it was exceedingly economical and that she carried sufficient fuel for 170 days' cruising. The fuel used is the regular Diesel-oil, although a heavier fuel-oil can be used at any time if desired. The "Tosca" bunkered at San Francisco and had sufficient fuel aboard to take her to Japan and back to Christiania.

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## THE FORTHCOMING WORLD-RACE FOR SUBMARINE POWER

ONE of the natural results of the Disarmament Treaty will be the keenest of competition among the navies of the World for the lead in submarine construction. Probably a few years will produce powers, speeds and efficiencies as yet not seriously considered by naval authorities, and which will be made possible by the adoption of Diesel-electric drive for propulsion and by concentration of naval-engineering skill on the other phases of construction as well as by strategic methods of operation, even if power-unit development be hampered by believed limitations of the size of Diesel-engine cylinders. Any drastic cutting of appropriations for submarine construction and development will be the most unwise action that Congress could possibly take. In fact, large appropriations for this department of the navy are highly advisable and economical at the present time, because it is apparent that all other countries will immediately display active interest in submarine building, which the Treaty results make possible and extremely probable. France has openly declared this intention, but she may not have the necessary funds.

It is fooling ourselves to assume that the final results of Germany's submarine-warfare proved that the submarine is beaten either against surface warships or merchant-ships, because in 1918 the German navy's increasing experience in submarine design, construction and action should have made this deadly weapon steadily gain in efficiency regardless of the development of counter weapons which necessarily must follow—but always some months behind. This would actually have been the case had the German surface-fleet been frequently patrolling on the high seas and in constant engagement with the allied ships, instead of remaining bottled-up in port to the disastrous detriment of the entire morale of her navy and nation, and at the same time allowing the Allies to center their marine energies on methods for submarine attack and evasion. Also, Germany was seriously hampered by lack of building materials. Germany's defeat was really due to the accumulated results from holding her battle-vessels in reserve too long, which naval experts have not properly recognized.

As we previously stated, during the last few months of the war when the submarines were well in hand, Germany was on her last legs, so to speak, and morale in her navy and factories was at a dangerously low ebb. Consequently there was far less efficiency than existed a year previously, whereas theoretically her submarine-navy should have been more efficient and less subject to capture. Vastly different would be the submarine campaign of a powerful country not demoralized with internal revolutions and other troubles, but with its navy at the height of efficiency. The country that creates enormously-powerful submarine and airship fleets in addition to the surface-vessels allotted to it under the Treaty, and which can maintain these fleets through a long war, will be able to control and defy the World, and even threaten to disregard the terms of the Treaty as regards methods of submarine warfare. Therefore America's submarine and aerial navies must equal those of any other nation.

Today the position of the leading submarine-navies of the World is as follows. The figures are surface-displacement tons, and are according to the Secretary of the British Admiralty:

| *Great Britain* | | *United States* | | *Japan* | | *France* | | *Italy* | |
|---|---|---|---|---|---|---|---|---|---|
| Built | Building | Built | Building | Built | Building | Built | Building | Built | Building |
| 70,376 | 10,190 | 53,792 | 40,808 | 10,054 | 22,165 | 30,873 | nil. | 17,640 | 2,616 |

What is the position of the big submarine development today? Although Germany in 1918 completed a splendid engineering feat in the production of a number of most excellent 3,000 shaft h.p. high-speed Diesel-engines, she never got them to sea—except in a couple of big submarines just prior to the Armistice. Now she can never use them for that purpose. On the other hand Great Britain, the United States, Japan, France and Italy all have some of these big motors, from which they can develop even higher powers. Our country cannot do so at present because no funds are available, and Congress has the Soldiers' Bonus too much in mind to bother with such a "minor" matter.

The British Admiralty is trying-out the installation of even higher-powered Diesel-engines in the K-type 1,880 tons steam-turbine submarines, and if successful will soon result in a tremendously powerful fleet of submersibles. Also the British have not less than three submarines armed with 12" guns, built for devastating land forts from the sea. Greater development from these two types is not a very difficult problem. The K-boats carry eight 18" torpedo-tubes and a 4" and a 3" gun. They are 334' long and one of 2,650 tons submerged-displacement, 10,000 h.p. and 24 knots speed.

As we said last August, and previously, Japan is building a big submersible, in which three two-cycle Diesel-engines of 4,000 shaft h.p. are being installed. This is sufficient to give a submarine with a surface-displacement of 2,200 tons, 350' length a speed of 23 to 25 knots, and she could carry ten 18" torpedo-tubes, one 6" gun and two 4" guns, as well as air-craft protection guns. We believe Japan's big submersible will closely follow these figures. If she puts a fleet of 50 such craft in service, our Pacific Coast will no longer be a popular place for the movies. And,—she is going to concentrate on submarine construction.

Italy is not doing much in the way of big submarines, except in plans, as witness the proposal of Naval Constructor Nabor Soliani, who, as illustrated in our issue of March, 1921, has designed four classes of big submarines varying from 21,600 tons, 24,000 h.p. and 16 knots speed, to 22,000 tons, 18,500 b.h.p. and 20 knots speed. These craft the Ansaldo-San-Giorgio shipyard are prepared to construct without going beyond the present Diesel cylinder-power limits.

Yet in the face of all these big submarines, the three new V-class of submarines now building for the U. S. Navy are a distinct advance, as their design allows of a big jump in power with subsequent boats, simply because Diesel-electric drive has been adopted. This allows of increasing the power, size and speed of the boat by adding generating units and without increasing the Diesel-cylinder size. These three submarines, are of 2,025 tons each, 300' length and 21 knots speed. The maximum power that can be used at one time is 7,000 b.h.p., less the small loss in the transmission—say 5 to 10 per cent. One 5" gun, 1 machine-gun and 6 torpedo-tubes will form the armanent, so they will not be as powerful as many existing foreign submarines. But, as just stated, they have the advantage of easy development to more formidable craft if Congress will wisely appropriate the money. As Secretary-of-the-Navy Edwin Denby recently advised us—"it is believed that this country will be able to keep abreast of other countries even if they concentrate on Diesel-engines for submarines, provided Congress sees fit to provide funds *necessary* for this research and development work, the necessity for which we ("MOTORSHIP") are familiar with." We are in thorough accord with Secretary Denby.

In these V-class submarines there will be two 2,500 b.h.p. Busch-Sulzer two-cycle Diesels, and two B. S. Diesels of 1,000 to 1,250 b.h.p., all driving generators, which furnish power-current to twin motors. The two smaller sets are used for cruising and all four, or 7,000 to 7,500 shaft h.p., at maximum speed. By increasing the size of subsequent boats it is a comparatively simple matter to put in two or three more of the big Diesel-units and so get 12,000 or 14,000 horsepower and thus have the biggest and fastest submersibles in the world. And an appropriation of about two or three million dollars will enable the first one to be completed. Shall America be the leader in this department, or shall she take a second or third place? Only Congress can answer.

## AN EXAMPLE WORTH COPYING

AN example for the Shipping Board can be secured from the shipping operations of the Norwegian Government, who several years ago purchased three single-screw Diesel-driven freighters and after making a good profit on the operations, resold them to New York shipowners at a profit of 14,500,000 kroners, or nearly three million dollars. This money is now to be used as a subsidy to relieve unemployment in Norwegian shipyards, and new motorships will be built.

## SHIPPING JOURNALS AND THE DIESEL-ENGINE

IT is unfortunate that shipping publications of a general nature occasionally tread on dangerous ground by attempting to discuss matters best left to technical publications, because the misleading impressions thereby conveyed to other non-technical men are calculated to do harm. In the Feb. 18th issue of "Nautical Gazette" in an editorial headed "Diesel Engine's Slow Headway," there is a reference to the "relatively poor showing of the Diesel-engined ship" immediately following a statement that there are only 2,000 motorships of 2,000,000 gross tons afloat or building, and that only 108 motorships of 204,286 gross tons under construction at the close of 1921.

To our way of thinking this is a reasonably good showing, and the magazine in question omits to mention that Lloyd's report states

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that motorship building in 1921 doubled the tonnage of 1920, showing a distinct growth at a time when new steamship building declined. This, however, is a matter of viewpoint; but we must take exception to the following paragraph that appeared in the same editorial in "Nautical Gazette," especially as it clearly demonstrates lack of familiarity with the operation of motorship machinery, viz.:

> The belief that the Diesel-engine is not as easy to operate or to keep in good running order as the steam engine *is largely ascribable to the circumstance that the Diesel cannot be stopped or reversed as readily as the latter type of engine.* A very simple process involving merely changing the position of certain valves in the case of a steam engine, the act of reversing in a Diesel-engine is a complicated proceeding where the position of some part of the mechanism has to be shifted. In addition, the Diesel-engine has to be started up in the opposite direction with the help of compressed air until it can again run on oil fuel. Sometimes the engine when reversed makes a number of revolutions before it starts firing again.

It would be interesting to know where the Editorial writer of "The Nautical Gazette" secured his information on the subject of the reversing marine Diesel-engines, and if he has ever been aboard a seagoing motorship and witnessed maneuvering?

Anyone familiar with motorships and their workings knows that maneuvering is considerably quicker with Diesel than with steam-engines, and with some designs of machinery a smart engineer can reverse from full-ahead to full-astern in five seconds, the average being eight or ten seconds. As regards the act of reversing being a complicated proceeding, the modern Diesel-engine has its control-levers so interlocked that a mistake on the operator's part is almost impossible, and the action comprises either turning a wheel, or pulling a couple of levers forward or backward, the various functions being mechanically performed by the mechanism which the levers control.

Another shipping journal, namely, "Nauticus," by a coincidence discusses the Diesel-engine in its number of the same date, namely, Feb. 18th, but apparently has taken care first to be a little more sure of its information with a view to avoiding rash conclusions. "Nauticus" says:

> Reversal with absolute certainty is one of the chief essentials in any marine engine. Innumerable gears have been devised to accomplish the direct reversal of the Diesel-engine. Probably no other part has excited the ingenuity of engineers so much or has had such scope for invention as this, and possibly no problem has been more successfully encountered. *Undoubtedly the reversal of the modern Diesel-engine can be performed as quickly and with as much certainty as with the steam-engine.* Reversal from full ahead to full astern can be carried out in 7 to 15 seconds; 10 seconds is a good average.

This it will be noticed is directly the opposite to the reflections of "Nautical Gazette"; and we may add that judging by the remainder of the discussion in "Nauticus" the writer had properly studied his subject before committing his findings to print..

## SHIPOWNERS AND COAL-VERSUS-OIL

ACCORDING to recent reports from France most steamships are again equipped for burning coal-fuel, due to this combustible having dropped to a much lower figure than boiler-oil. This is a situation anticipated by "MOTORSHIP" and on several occasions we have published timely warnings to oil-companies that if coal dropped considerably in price there would be a general reversion to coal not only abroad but also in this country. And that to avoid loss of an active market the oil-companies would be wise to do their utmost to encourage more general adoption of Diesel oil-engine propelling-power, because coal will have to drop to about one dollar per ton to successfully compete against motor power. Coal at $5.50 per ton at British ports lately caused the reversion to coal-burning among French shipowners, and we believe that within two years bunker-coal will be available in Great Britain at less than $4.00—and probably $3.00—and that if domestic railroad-rates don't drop sufficiently to allow of American coal being sold at under $5.00 per ton at Atlantic ports it will mean the importing of British coal in motorships for underselling both American oil and coal.

## CONVERSION OF WORK BOATS TO HEAVY-OIL POWER

IN recent issues of some of our contemporaries articles have appeared in which claims have been made that fishing-boats and tow-boats now powered with gasolene or kerosene engines of 50 to 100 brake h.p. are not heavily enough constructed to stand the additional weight of a Diesel or surface-ignition oil-engine of the same power. In one case the statement appeared from the pen of a well-known Pacific Coast naval architect. However, it is obvious from recorded results of conversions of this nature that such is not the case. Practically all such heavy oil-engine installations have proven actually successful and only in exceptions has it been necessary to strengthen the hulls in any way. Our readers are familiar with many instances, and in a number of jobs the original propeller shaft, stern-bearing and stuffing-box have been retained. Some of these boats have been running steadily over long periods without any evidence of weakness.

## GERMANY AND ITS PROTEST AGAINST DIESEL-ENGINE CONSTRUCTION

THE German Ambassador in Paris recently entered an official protest against the declared intention of the Inter-Allied Military and Naval Commission to forbid the further construction of Diesel-engines in Germany. Apparently the order was inspired by a fear that Diesel-motors could be used for military purposes, but the official note of the Ambassador insists that these engines are being constructed solely for peace and commercial purposes, and resents the Commission's order as an unwarranted interference with the German industry and one against which the German Government is bound to protest.

"Motorship" has already expressed the view that such radical action is entirely unnecessary and will interfere with Germany's industry and commerce, as the economy to be derived by the use of the Diesel-engine will be of the greatest value to that country—particularly because of the vast extent to which Diesel-engines are used, both on land and at sea. It should be obvious to anyone that it would take at least ten years for Germany to get into the position where she could possibly fight through another war, and by that time it is hardly likely that the various submarine Diesel-engines now used for commercial purposes will be in a condition to warrant risking their re-installation in submarines. Also many new heavy-duty slow-speed Diesel-engines now being constructed are actually useless for the purposes of propelling submarines.

# The Still Engine for Marine Propulsion

***Extracts from Paper Read Before the Institution of Engineers and Shipbuilders in Scotland, February 14, 1922, by Archibald Rennie***

NOW that a contract for a ship to be propelled by engines built on the Still principle has been placed, as mentioned on page 194 of our March issue, increased in this type of engine is manifest. The use of this combined Diesel-steam plant in vessels has coined a new word for such craft, i. e., "motor-steamer," and undoubtedly engineers are anxious to become better acquainted with what is admittedly such a wide departure from current Diesel-engine practice. Therefore, to supplement the descriptions of the Still engine which have appeared in MOTORSHIP from time to time, we present a brief summary of this comprehensive paper by Mr. Rennie. The paper is very exhaustive, is well illustrated. It must have entailed weeks of work in preparation, aside from the actual experimental work.

The principle of design briefly summed up is the generation of power through the use of oil consumed within the cylinder for the down-stroke, steam produced by heat recovered from the exhaust-gases through the medium of a re-generator or boiler forming a supplementary source of power for use on the up-stroke on the lower side of the piston. The fundamental principle is the recovery of heat from the waste products of combustion and the utilization of that heat in the engine itself for the development of power. In the words of Mr. Rennie, "During the past few years many researches have been made which show that heavy-oil engines designed to operate on the Still system give a lower fuel-consumption per brake horse-power, have a lighter weight per unite of power, and occupy less space than any other known type of heavy-oil engine." The system may be applied to either two-stroke or four-stroke internal-combustion engines.

In the paper, consideration is, however, given only to an engine of the single-piston type working on the two-stroke port scavenging principle, employing airless (solid) injection and on the steam side operating on the single-acting principle, further economy being obtained by compounding the cylinders of one or more groups on this steam side. Both functions occur once per revolution, the steam side being 180 degrees of crank-angle behind the oil side, so that the engine is double-acting in its operation. In place of oil or water being circulated to the pistons for cooling purposes, in the Still engine this function is performed by the operating steam, which in keeping the piston cool itself tends to become superheated, thus reacting beneficially on the efficiency of the steam cycle. The steam generated from the oil burned in the re-generator displaces compressed air for starting and maneuvring purposes; when starting

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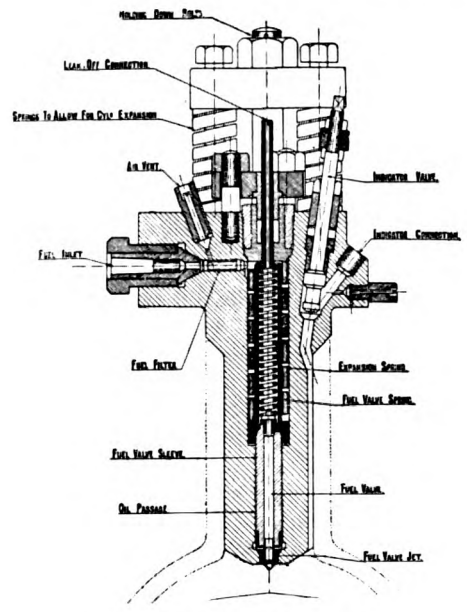
operations have been completed steam continues to be generated from waste heat of combustion alone, and is utilized in the cylinders, thus adding energy without adding to fuel cost.

A range of power from 700 to 7,000 brake horse-power having been determined upon, with single or twin screws, an engine having a cylinder of 22 inches diameter and 36 inches stroke, giving a brake h.p. of 350 at 120 r.p.m. was designed and a single-cylinder experimental engine constructed. Engines of up to six cylinders of this size are planned. The simple A-frame columns, each carrying one-half of the crosshead guides of the double-slipper type, is used, the combustion cylinder consisting of working liner, outer mantle and scavenging and exhaust-belt supported from the columns by four distance-pieces secured by large steel bolts having their upper ends secured to the mantle and their lower ends let into and secured to the upper part of the columns. These bolts transmit the combustion load to the bedplate through the columns. It will be noted from drawing of the engine that the working liner is secured at the bottom of its length and is free within the mantle to adjust itself to changing temperatures, the mantle and belt being free to adjust themselves independent of the liner. Examination of all parts of the piston head and liner can be made. The combustion exhaust-ports in the lower end of the liner are of special hooded form, completely water-cooled.

The main idea in designing the Still-engine liner is to reduce the temperature differences and consequent heat-losses between the inner and outer walls to a minimum and the rapid transfer of heat to the jacket water. The steam-cylinder is supported quite independent of the combustion-cylinder and has complete freedom for expansion. Both have a common piston which is amply guided as it passes from one to the other by a series of fingers meshing with each other. The piston is formed of a skirt and a head spirally ribbed internally to guide the flow of steam in as long a line as possible and providing flexibility and freedom of adjustment to temperature conditions. The piston-rod crosshead is worthy of attention. Trouble with heavily loaded crosshead bearings in Diesel-engines is frequent, but in the Still engine the load is reduced to a minimum by making the full diameter and length of the pin on its under side available for the downward combustion load and on its upper side it is secured to a saddle which takes the half-bearings for the upward steam load, this saddle being bossed and provided for the attachment of the complete crosshead to the piston-rod by cotter. Therefore, the top and bottom bushes work on different bearing diameters, these being concentric. The materials entering into the construction of the Still engine are practically usual Diesel-engine composition.

The whole engine is symmetrical about its force and aft centre-line. The only valves in operation when running are the fuel-injection valve on the combustion side and the steam and exhaust-valves on the steam side. The former is worked by the fuel-injection pressure and the latter by a system of oil under pressure. The fuel-injection valve, spring-loaded, is in the cylinder-head, the pump being fitted at the crankshaft level, being worked direct from the shaft by a cam. The oil-pressure system for operating the steam inlet and exhaust-valves is especially interesting inasmuch as it eliminates all lay-shafts, eccentrics, rods, etc. A simple plunger-pump driven from the main shaft supplies oil at a pressure of



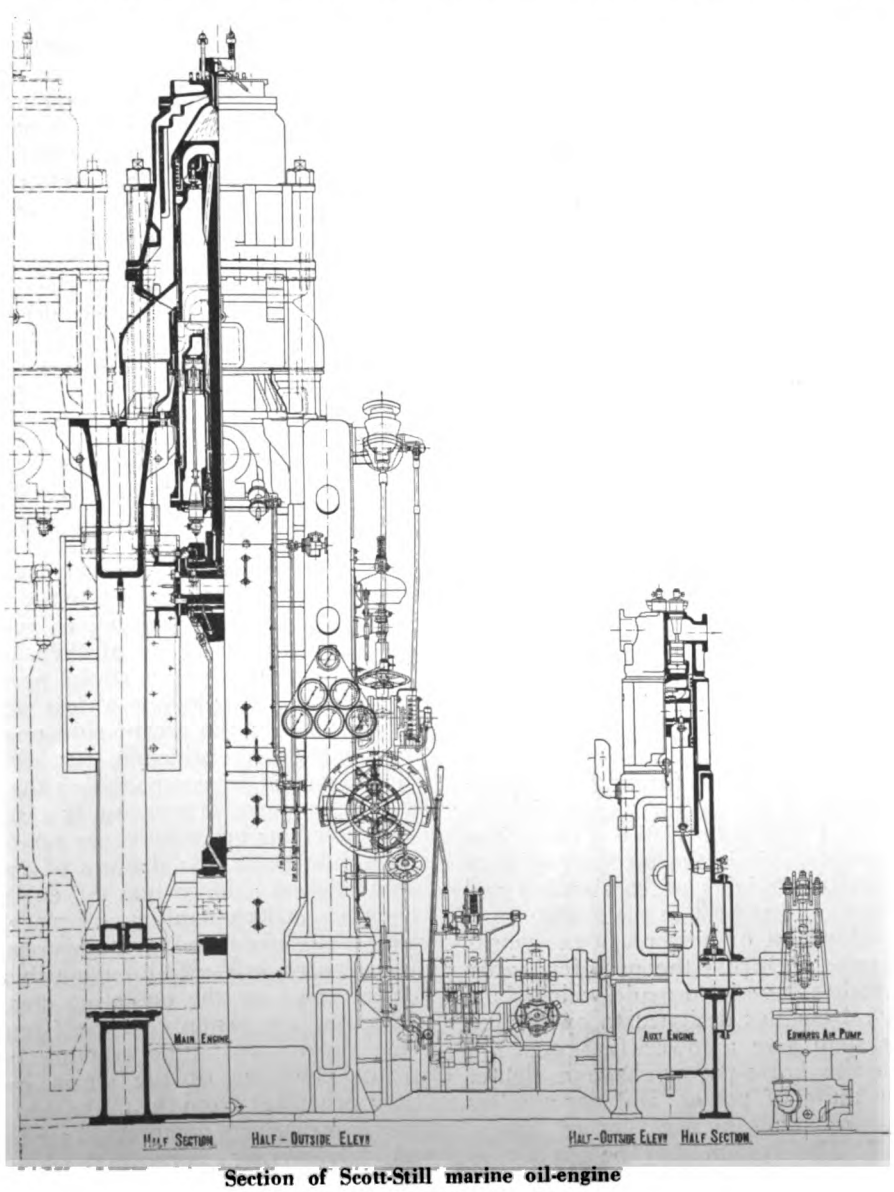

**Scott-Still injection-valve**

from 350 to 450 lbs. per sq. in. to the valves. The oil is distributed by a distributor worked by spiral-gearing from the main-shaft, each being a cylinder in form, arranged with a series of ports in the barrel in which a piston with corresponding ports revolves continuously. Once per revolution they register and give an impulse to the column of oil between them and the valves, thus opening the latter, the impulse being received by an operator interposed for the purpose.

As the engine is started up and manoeuvred by steam the control of these operations is effected through the distributors. A control-box operated by the manoeuvring hand-wheel is connected to the oil-pressure system and on moving this hand-wheel to "Ahead" on the dial the shuttle valve in the exhaust and starting distributor is set by the oil-pressure for ahead running. Further movement of the hand-wheel to "Starting" position connects the starting end of the distributor to the steam-valve operator on the cylinder to give a late cut-off and starts the engine. Further movement to "Running" position cuts out the starting steam-distributor and brings in the running steam-distributor with its early cut-off and puts the engine on fuel-oil. By placing the wheel at the "Steam" position on the dial the engine is run on steam alone, while there is a simple interlocking device to prevent the engine being run on oil except when the hand-wheel is in the "Running" position and steam is available for piston-cooling. "Astern" running is accomplished in the same manner by simply reversing the direction of movement of the hand-wheel.

The auxiliaries required for the working of the Still engine consist of forced-lubrication pump and a scavenging-air blower for the combustion side and for the steam side a small condenser with air, circulating and feed pumps and a re-generator with feed-heater, filter circulating-pump and filters. All are driven by the engine itself except the scavenging-air blower. The filter circulating-pump is a simple displacement pump arranged to draw from the re-generator and discharge back into it again, a filter being arranged in the circuit. The re-generator itself is a small Cochran oil-fired boiler. Scavenging-air is supplied by a small electrically-driven turbo-blower. A governor of common ball-type is fitted, acting through a servo-motor and controlling the setting of the spill valve on the fuel-injection pump.

In starting from cold the burner under the re-generator is lighted and steam raised in the usual way. As soon as the temperature in the re-generator begins to rise a natural thermal




**Section of Scott-Still marine oil-engine**

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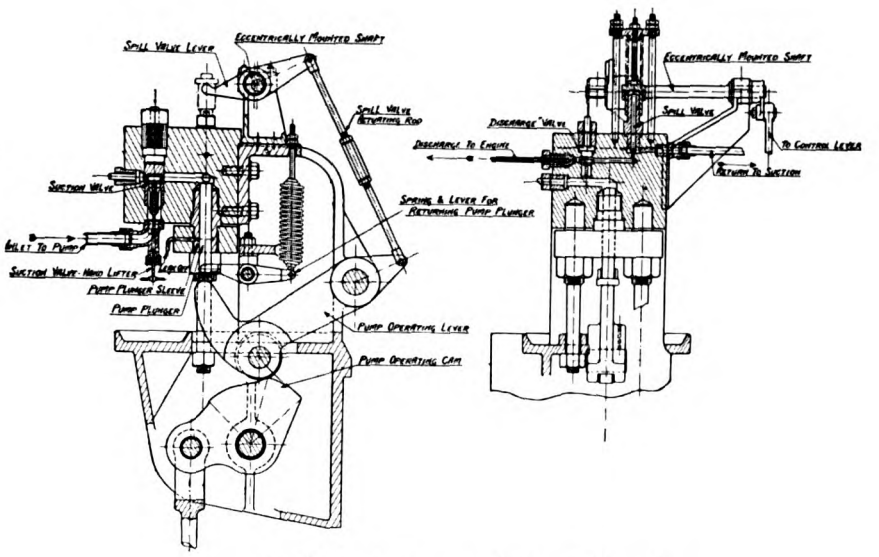
circulation of the water between it and the cylinder takes place so that by the time steam is raised the engine is warmed up. The starting is then accomplished as above described. The engine may be run on steam alone for any length of time.

As an indication of the results of many trials the record of a typical 8 hour test reads as follows: Combustion, M.E.P., 80.5; H.P. Steam, M.E.P., 3.8; L.P. Steam, M.E.P., 6.01; total M.E.P., 90.31; Revs. per min., 125; total I.H.P., 391; total B.H.P., 345; oil per B.H.P., hour, 0.367; mechanical efficiency, 0.88; brake load in lbs., 1,380. An endurance run of fourteen days and nights of continuous running was mad, at the conclusion of which examination of the engine by Lloyd's representatives brought the report that "the cylinder, piston, piston-ring and feed-water filter were found in good condition. The boiler was examined internally and found good and absolutely free from oil. From start to finish of this trial no trouble was caused by any part other than the breaking of the fuel-valve spring on two occasions and the partial loss of vacuum on one occasion. There is great regularity as regards the revolutions and the brake h.p. and we would state definitely that not only did the engine run well throughout the trial but was in thoroughly good condition at the finish.

The quantity of steam generated from waste heat by the single-cylinder is 800 lbs. per hour at 120 lbs. pressure per sq. in. when the combustion cylinder is working with about 80 lbs. mean-pressure, equal to a normal load of about 340 brake h.p. It increases as the load is reduced until at about 35 lbs. mean-pressure in the combustion-cylinder just sufficient heat is being recovered to equalize the radiation losses. As the load is reduced the quantity of fuel-oil burned is less and the waste heat available for steam generation is, therefore, less. At mean-pressures of about 40 lbs. and under in the combustion cylinder, no steam is necessary for piston-cooling as the rate of heat-transfer by contact with the cylinder-wall is sufficient to keep the piston cool. About 12 per cent of the total horse-power at full normal load is obtained from the steam side, but in a multi-cylinder engine from 15 to 20 per cent would be obtained.

Mr. Rennie concludes his paper with a discussion, well illustrated by plans, of the possibilities of installation in ships requiring large power. He points out the advantage of this type of engine in being able to supplement the steam supply in case of emergency by simply lighting one or more burners in the re-generator. In addition to doing away with considerable moving mechanism the Still engine has a high factor of safety because of the low compression-pressures, which are possible because the incoming air takes up heat from the cylinder-wall instead of losing heat to the wall as is usual in Diesel-engines. Also the Still engine is more flexible than the Diesel-engine.




**Fuel-injection pump of Scott-Still engine**

# Among the Motor Work-Boats

### NEW CANADIAN MOTOR-VESSEL

Now building to the order of the Powell River Pulp & Paper Co. is an oil-engined motor-vessel of 132 feet length. The hull is being constructed at the yard of W. R. Menchions & Co., Georgia St., Vancouver, B. C.

### TWO GASOLINE ENGINES DISCARDED

Captain Jamison operates passenger ferry-boats from Sheepshead Bay, Long Island, but gasoline costs have become so great that two 60 h.p. Fairbanks-Morse oil-engines are being installed to replace the gasoline-engines which have operated his two boats.

### THREE MORE FISHING VESSELS DISCARD GASOLINE ENGINES

One 60 h.p. and two 100 h.p. oil-engines are replacing gasoline-engines in Sheepshead Bay, N. Y., fishing-vessels, as well as in two ferry-boats referred to elsewhere. Just further proof of the fact that the economy of the oil-engine is bound to win out in these days of close competition.

### THE NEW WOLVERINE HEAVY-OIL ENGINE

There is evidently a strong belief on the part of manufacturers that oil-engines of moderate power must be considered as having a very good market, for still another well-known firm has brought out a heavy-oil engine. This is the Wolverine Motor Works of Bridgeport, Conn., whose gasoline and kerosene motors are known the world over. Their new engine is of the four-cycle type, of 23 to 95 h.p. in one to four cylinders and fuel injection is on the solid-injection principle.

### ANOTHER TRAWLER WITH OIL-ENGINES

We have recently described the installation of oil-engines in several fishing and trawling vessels, replacing other types of internal-combustion engines. In this issue we are illustrating still another craft, the otter trawler "Virginia," owned by Captain Cornelius Zegel of the picturesque island of Nantucket, off the Massachusetts coast, which trim little sloop has just been powered with an oil-engine.

This is a two-cylinder direct-reversible 40-50 b.h.p. Bolinders surface-ignition engine driving a Columbian bronze propeller of 36 inches diam. and 30 inches. On her recent trial trip after her new engine had been installed at D. N. Kelley's marine railway, Fairhaven, Mass., she made a speed of 9 knots as against the previous speed of 7 knots with her former 36 h.p. three-cylinder gasoline engine. The "Virginia" is of the following dimensions:

| | |
|---|---|
| Length over all | 52 ft. 0 in. |
| Length water-line | 47 ft. 0 in. |
| Breadth | 17 ft. 0 in. |
| Depth | 6 ft. 0 in. |
| Draught | 5 ft. 6 in. |
| Tons, register | 28 tons |

The increased speed could not have been obtained by a gasoline-engine without almost prohibitive cost of fuel. By replacing gasoline engines with oil-engines many commercial craft are now enabled to reach port quicker and obtain larger profits, because they can make better speed at greatly reduced fuel-costs with higher-powered engines of the oil-engine type. The field for gasoline-engines is rapidly being narrowed to the pleasure boat field and even here the oil-engine is entering strongly.

**The auxiliary sloop "Virginia," powered with a 50-h.p. Bolinder engine**

### EXPERIENCED STEAM TOW-BOAT OPERATOR INSTALLS OIL-ENGINE

When one mets a man who has operated a 100 h.p. steam-tug and a 100 h.p. gasoline-tug, and then contemplates putting into operation still another tug, it is quite natural to be interested in noting what power he selects for this craft. Such a man is H. Tellefsen of Staten Island, N. Y., who has selected a Fairbanks-Morse surface-ignition oil-engine of 100 h.p. for his third towing-craft. When this boat has been put into operation Mr. Tellefsen will have comparative data which will prove of great value to operators of work-boats.

### DIESEL AND OIL-ENGINES AT THE RECENT MOTOR BOAT SHOW

The gasoline-engine and the pleasure boat are the main features of the annual Motor Boat Show held in New York. But this year considerable interest was aroused by several Diesel-engines an exhibition at Grand Central Palace, Feb. 17-25. Among these were a 135 h.p. Winton Diesel engine, Winton auxiliary air-compressor and generator set, a Sperry compound Diesel-engine, the Kraus continuous-combustion oil-engine exhibited by the Fuel Oil Motors Corp. Also a 180 h.p. Nelseco Diesel-engine and a 100 h.p. lightweight, high-speed M.A.N. Diesel-engine built in Germany, these being exhibited by the New London Ship and Engine Co. There is a bright future for the Diesel-engine in this type of craft.

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# New Motor Derrick-Lighter

***"Worthington," A 333-Tons Harbor Service Vessel, Propelled by the First of the New Worthington Airless-Injection Marine Oil-Engines***

SINCE our publication last November of the first description of the new design of moderate-powered oil-engine produced by the Worthington Pump & Machinery Corporation at their East Cambridge plant work-boat owners have been awaiting the first ship's installation with more than usual interest, because of the many advantages to be derived dependent upon the practical demonstration of the design. It will be remembered that the engine, although of only 300 b.h.p., is of the two-cycle crosshead type with airless-injection of fuel and without scavenging-air compression in the crankcase itself. Few marine oil-engines of this power have crossheads and guides, constructional costs hitherto preventing this, but the adoption of this feature undoubtedly will add durability and reliability to the engine.

Instead of selling the first marine-engine to outside interests, and letting the owner absorb the expense of any possible delay should any minor changes in design have to be made, the builders decided to "swallow their own physic" and place the engine in a vessel handling freight between one of their own engineering works and ocean-going freighters, so built a new vessel to take the place of their steam-driven derrick-lighter, "Daniel Wheeler," operating in New York harbor and vicinity. In the same way the Worthington Company installed their first stationary-type engine of similar design in their Blake-Knowles Works, and have since received orders for 40 engines, which are now under construction for land purposes.

To give a conception of what the new lighter "Worthington" will have to perform, we may say that the "Daniel Wheeler" in an average month of operation was under way 59 hours, and the balance of the time either at the dock handling cargo or laid up overnight, the single crew working an eight-hour day. Her coal bill was $420.16 for that period of time during a recent month. With the new oil-engined craft the fuel costs during a similar period of operation figures out at $250.00, using Standard Diesel oil.

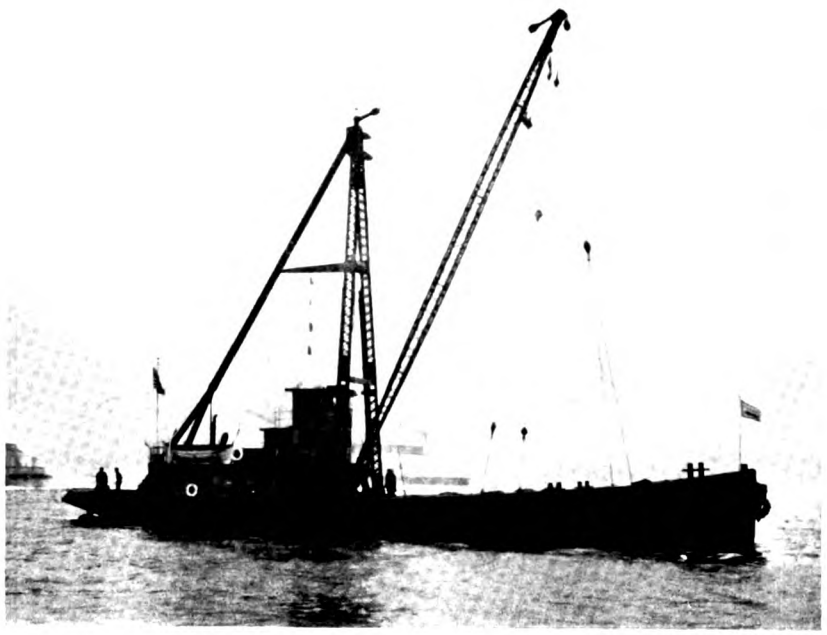
The shipyard where the hull was built is located on an inlet 14 miles from the deep water of Delaware Bay and the "Worthington" was driven through very shallow and tortuous waters of Missapillian Creek under her own power. It required 6 days of almost constant maneuvring to negotiate these 14 miles, the boat being forced through the mud by driving the engine at full speed and by putting the hoisting winches to work on cables led to anchors set in the mud ahead. After this arduous service thick mud six inches deep was rmoved from the cylinder cooling-jackets, but none of the equipment was any the worse because of this overload. Afterwards the boat made the sea trip to New York in severe winter weather without any interruption.

A demonstration run of the "Worthington" was given on the Hudson and East Rivers on March 8th, a number of interested *and enthusiastic* visitors being aboard. The run passed off without a hitch, both the main engine and auxiliary engines working without a miss. She is a wooden vessel and her dimensions are as follows:

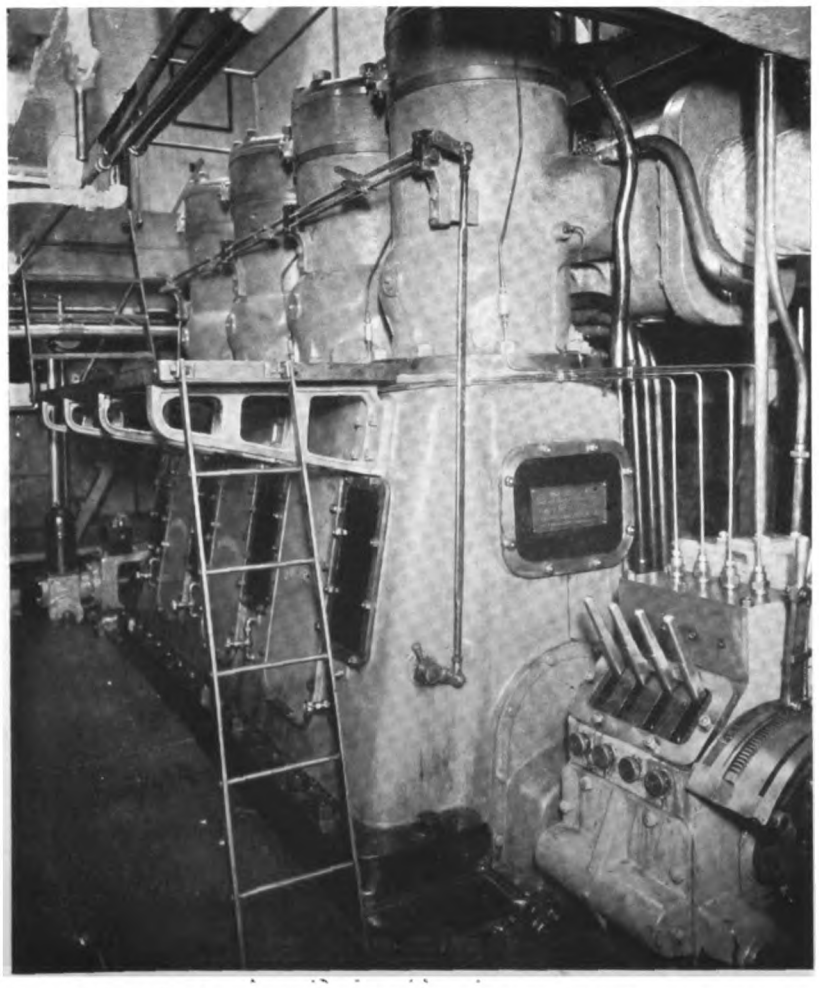
| | |
|---|---|
| Length | 133 feet |
| Breadth | 35 feet |
| Draft (loaded) | 10 feet |
| Gross Tonnage | 333 tons |
| Net Tonnage | 225 tons |
| Power | 300 shaft h.p. |
| Lifting Capacity of Derrick | 20 tons |

The hull is of unusually heavy construction to withstand the hard usage incident to service around the docks and harbor shipping. It is full bodied in order to provide the necessary stability for operating the cargo-derrick at long radii. An "A" frame derrick of 20 tons lifting capacity, of steel lattice-work construction, is mounted abaft the midship line with a back leg extending to within a few feet of the stern. About fifteen feet above the deck this back leg is divided into a fish tail, the two parts spreading out to within five feet of the rail on each side. The top of the "A" frame stands 70 ft. above the main deck line. The derrick-boom is 90 ft. long and is stepped on a tripod base 7 ft. above the main deck.

The derrick is mounted on foundations built up on fore and aft and athwartship trusses under the main deck and in the vicinity of the trusses the spaces between hull frames and between deck beams are filled in solid with timbers. Large U-bolts hold the derrick legs down and pass through the trusses to the hull framing, so that all the stresses from the derrick are carried right to the bottom of the hull.



The new derrick lighter "Worthington"



The 300 h.p. Worthington oil-engine in the derrick lighter. In the foreground can be seen the fuel-pump and engine control lever

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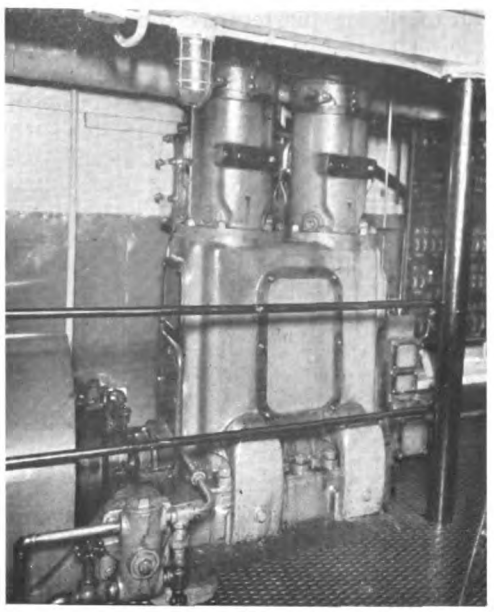
In the space between the derrick A-frame and the back leg is located the deck-house, containing living quarters for the crew, operating-room for controlling the derrick, and the pilot house. From the "A" frame to the stern of the boat is clear deck space for cargo stowage. On boats of this type it is customary to carry all cargo on deck, but on this vessel a large main-deck hatch is provided so that perishable freight can be stowed in the hold if it should be necessary to keep it on board for any great length of time.

The engine-room is located in the stern of the ship and contains the main propelling oil-engine, the auxiliary generating-set, for supplying current to the derrick-motor, auxiliaries and electric lights, the emergency lighting-set, auxiliary air-compressor, auxiliary lubricating-oil circulating-pump, auxiliary cooling-water circulating pump, oil-cooler, hot-water heating-boiler and starting-air tanks.

The main engine is a Worthington two-cycle, airless-injection, 4-cylinder Diesel type engine, with cylinders 15¼" diameter by 16" stroke, developing 300 B.H.P. at 275 R.P.M. This engine drives a Trout bronze propeller. All of the control-gear and fuel-pumps are included in a sub-assembly at the forward end of the engine. On the after end, just abaft the flywheel, is another sub-assembly consisting of a lubricating-oil circulating-pump, cooling-water circulating pump, starting-air compressor, and Richardson Phenix mechanical cylinder lubricators, all driven from one eccentric. Attached to the aft end of the engine-bed is a S.K.F. ball thrust bearing. As we already described one engine, we do not propose to redescribe the design at this time.

On the starboard side, forward is an auxiliary set consisting of a Worthington two-cycle, airless-injection, twin-cylinder, Diesel type engine of 50 H.P. direct-connected to a G.E. 38 K.W., D.C., generator delivering current at 220 volts. A cooling-water circulating-pump, a bilge-pump, and a lubricating oil circulating pump are attached to this engine. This set supplies current for operating the derrick engine, the auxiliary air compressor, auxiliary pump, and electric lights.

For pumping up starting-air when the main engine compressor is not in operation, a Blake & Knowles (manufactured by the Worthington Company), 2-stage G.E.C. 7½ B.H.P. electric-motor driven compressor is provided. This compressor is provided with a Cutler Hammer automatic-starter, which can be set to maintain the air in the starting-air reservoirs at any desired pressure, a combined pressure-gauge and electric switch-making contact and closing the starting-circuit to the



The Worthington auxiliary generating-set

air-compressor motor when the air pressure in the tanks falls to the desired minimum and breaking contact when full pressure is reached. As long as the main attached compressor keeps the pressure in the starting-air tanks between 250 and 350 lbs. the auxiliary compressor does not operate. But, if engine maneuvers are made so frequently that the attached compressor cannot keep up the supply and the pressure falls to 250 lbs., the starter-gauge closes the circuit, so the auxiliary compressor starts without attention from the engineer and keeps running until the air-pressure reaches 350 lbs. Then the starter-gauge opens the circuit and the auxiliary compressor stops.

For emergency use, if the lubricating-oil pump on either the main or auxiliary engine stops working, a motor-driven rotary oil-pump is provided. For emergency cooling-water circulation a Worthington 2" volute, centrifugal pump, driven by an 8 H.P. Crocker-Wheeler electric motor, is provided. This pump has a connection to the bilge and can also be used to supply water to the fire-hydrants on deck. The motor turns at 180 R.P.M. and is of 230 volts.

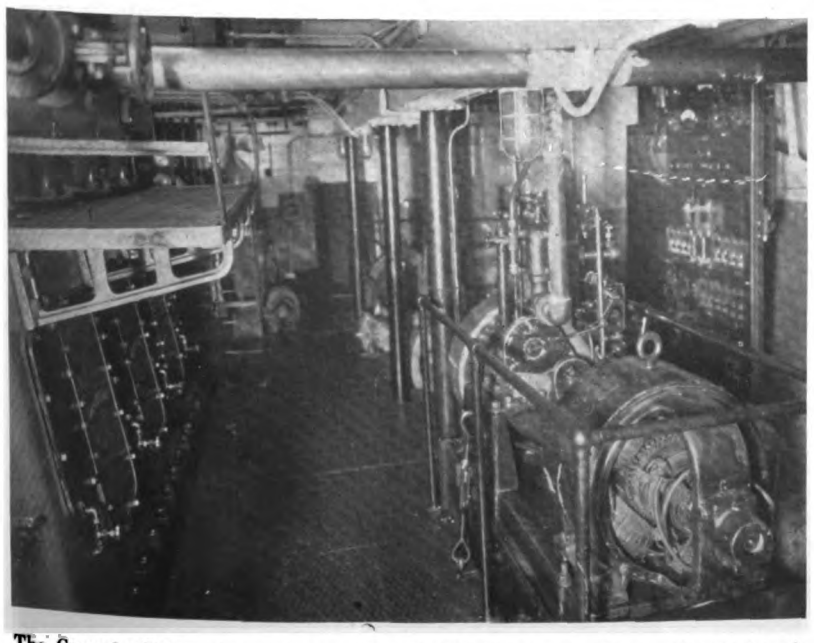
A Griscom-Russell vertical oil-cooler is located in a very accessible position on the port side of the main-engine and is so connected that it may be used to cool the bearing lubricating oil. Or, in cold weather—if the oil is too stiff for proper circulation—the hot jacket-water from the engine may be circulated through the cooler and the oil heated.

For supplying current for lighting the boat or operating any of the auxiliary pumps when the 50 H.P. auxiliary set is shut down a Cummins Hvid-Brons type oil-engine of 7 H.P. is provided, connected to a 6 K.W. 240 Volt Triumph, D.C. generator. This engine burns the same fuel as the main-engine. If for any reason all the starting-air should be lost, so that the 50 H.P. auxiliary oil-engine cannot be started, this small set can be started by hand and will supply power enough to operate the auxiliary air-compressor and pump up the starting-air.

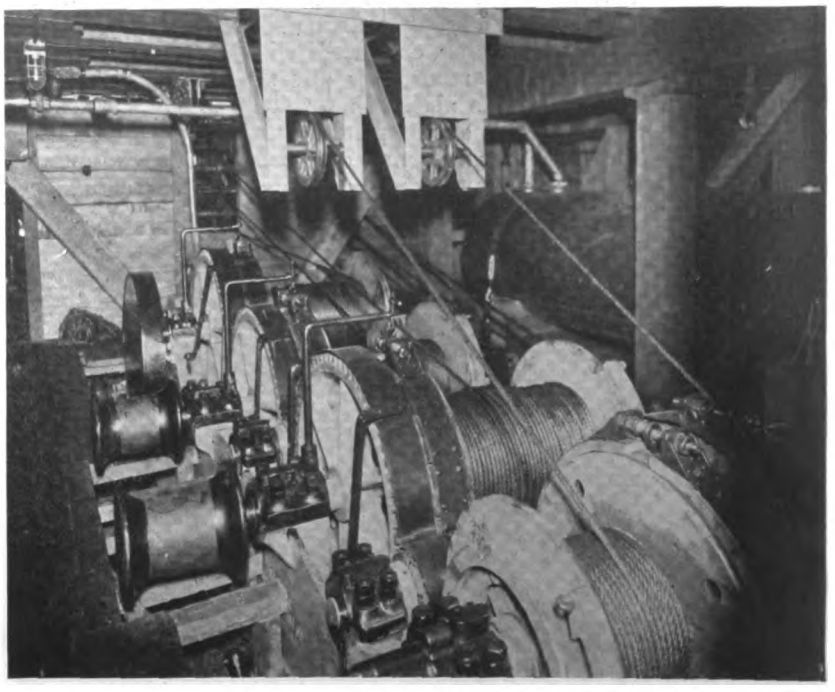
Starting-air at 350 lbs. pressure is stored in six cylindrical tanks of about 20 cu. ft. capacity each, located in the extreme aft end of the engine-room. This greatly exceeds the air requirements for the engine, but the owners of the boat wished to be on the safe side and insure the boat against loss of maneuvering power in situations where very complicated maneuvers are required around crowded docks or among harbor shipping. In service it has been found that for normal operation two of these tanks are ample.

Air at 100 lbs. pressure for operating the Strombos siren is stored in a tank that is a duplicate of the starting-air tanks. Air is supplied to it through a ¼" pipe and through a reducing-valve from the starting-air reservoir. This tank was made of the same strength as the starting air tanks as a safety precaution in case the reducing-valve should get out of order and permit full-pressure of air to enter the tank.

The fuel supply is carried in two cylindrical steel-tanks, of 4 tons capacity each, located outboard, one on each side in the hoisting-engine compartment just forward of the engine room. At the main deck level in the engine-room entrance, just above the main engine are located two daily service-tanks each of sufficient capacity to operate the main engine continuously for six hours. A small pump driven from the crankshaft of the 50 h.p. oil-engine transfers oil from the main tanks to the service tanks and a hand operated oil pump is provided as a standby. On the port side just forward of the fuel-tank is a fresh-water storage-tank, while in a corresponding position on the starboard side is the lubricating oil storage tank. In a compartment just forward of the engine room is located the hoisting engine for operating the derrick. This is a five-drum machine driven by a 25 h.p. G. E. motor and built by the National Hoisting Engine Co. The wire cable from each drum



The Cummins-Triumph emergency electric lighting-set in the engine-room of the "Worthington"



The National winch that operates the derrick

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is led by means of suitable pulleys to a point directly beneath the derrick then up through the deck to its proper place on the derrick. By means of reach rods and bell-cranks the controls for all drums are operated by a bank of levers located in a glass enclosed operating room directly beneath the pilot house. A controller of the trolley-car type for controlling the hoisting-engine motor is also located in this room.

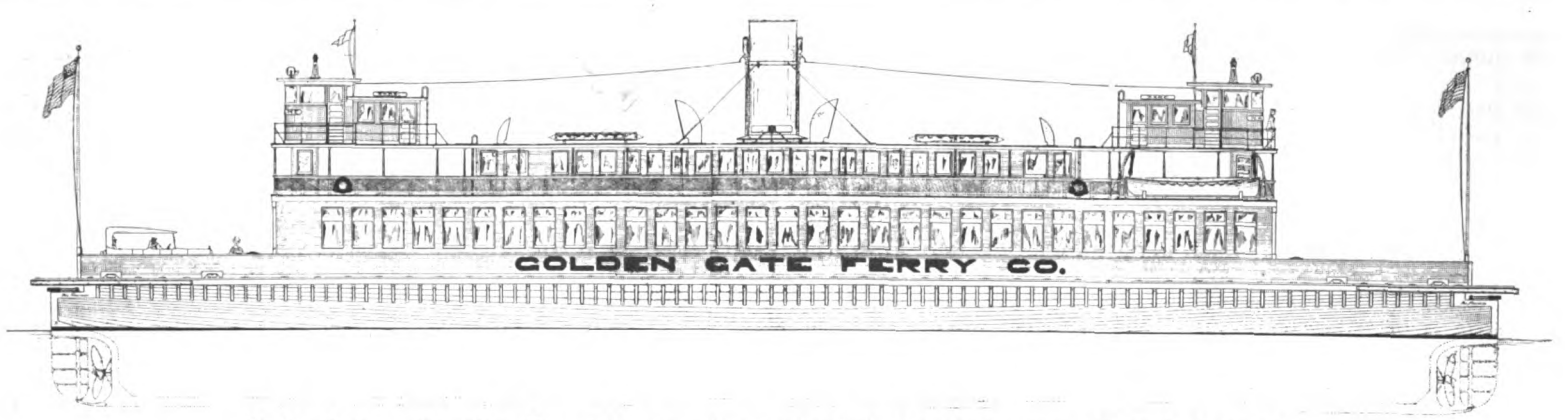
At the level of the main deck in the deck-house are two single and two double staterooms, one for the chief-engineer, one for asst. engineer, one for deckhand and cook and one for two deck hands. At the after end of the deck-house on the port side is the galley, opening into the mess-room on the starboard side. On the second deck in the deck house are two staterooms, one for the captain and one for the mate. On the same level and just forward of these two staterooms is the derrick operating room. Above the operating-room is the pilot-house, handsomely finished in hardwood. The appointments and finish of all the living quarters are somewhat above the average practice in harbor work boats.

In addition to the usual fire-fighting equipment required by law, additional protection against oil fires is provided in the form of a Foamite Firefoam engine of 80 gals. capacity installed in the forward part of the engine-room hatch with sufficient hose attached to reach any part of the boat. In case of fire this machine is put into operation simply by opening one valve and the 80 gals. of mixture will produce 700 gals. of fire-smothering foam under sufficient pressure to project it 50 ft. from the hose nozzle. So effective is this apparatus for fighting oil fires that a very material reduction in insurance rate is granted by the Underwriters where it is installed. It was supplied by Chas. Cory Co., of New York.

For heating the boat an Arcola hot-water system of the ordinary house-heating type is installed, the heating unit being located in the engine-room. During the severe weather of the past winter this system proved so effective that it was found necessary to remove some of the radiators from the living quarters to reduce the heating effect.

For use in warping the vessel, pulling on lines, etc., a warping-winch, driven by a 10 h.p. motor is located inside the deck house in the forward end of the engine-room hatch, with a through shaft extending outside the deck house on each side and a drum on each end of the shaft.

The "Worthington" was built by the Vinyard Shipbuilding Company at Milford, Delaware, from designs prepared by Eads Johnson, of New York City. In preparing the designs for this vessel the naval architect collaborated with the Worthington Company's engineers with a view towards achieving the most successful adaptation of this new type of power equipment to the special conditions of the service in which the boat was to engage. The derrick was built and installed by the Terry Manufacturing Company, New York City.




**Profile of the Golden Gate Ferry to be propelled by Pacific-Werkspoor-Diesel and General Electric Drive**

### MOTORSHIP "GLENGARRY" LEAVES ON MAIDEN VOYAGE

The new 14,000 tons d.w. freighter "Glengarry," of the Glen Line, left the Harland & Wolff plant on the Clyde on the 23rd of February on her maiden voyage to the Far East. She is 502′ long overall, and is propelled by twin 8-cylinder four-cycle type Harland & Wolf, B. & W. Diesel-engines, together developing 6,000 I.H.P. at 115 R.P.M. She has first-class accommodation for twelve passengers, similar to other British motorships of this class.

### WORLD'S HIGHEST-POWERED DIESEL MARINE-ENGINE

Now under construction at the works of Sulzer-Freres, Winterthur, Switzerland, is a marine-type Diesel-engine of 3,500 shaft h.p. in 6-cylinders. This engine when completed will hold for a short time the record for power, although shortly after it is placed in service several larger engines will be completed elsewhere, as well as three naval engines of 4,000 shaft h.p. at their own plant. Bigger marine Diesel-engines have been built in Germany, but they since have been dismantled as they were constructed for battleship purposes. Sulzers also have built two 4,000 b.h.p. stationary Diesel-engines.

In the 3,500 b.h.p. Sulzer-engine the crank-shaft has a total length of 53′ ¼″ and is in four parts coupled together. Each of the two middle sections has three cranks of 23.6 in. radius, set at an angle of 60 deg. to each other. The flywheel and thrust-bearing are carried on the section to the left, while the part to the right has two smaller cranks for the two injection-air compressors.

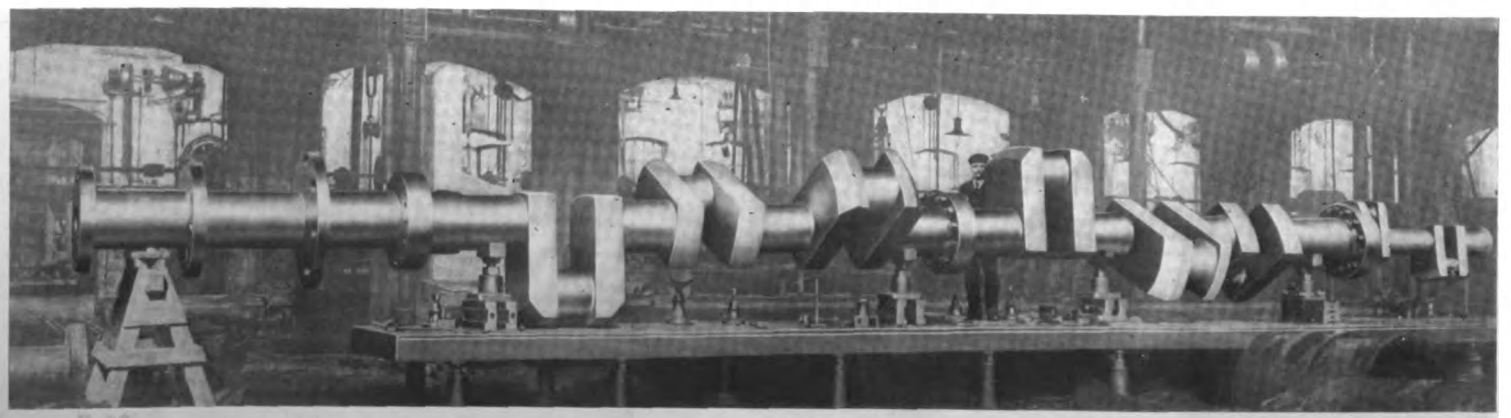
For these large two-cycle marine engines Sulzer Brothers have, as is known, adopted the system of scavenging by air from turbo blowers, driven independently of the main engines by electric motors. While at sea, this means that an auxiliary engine must be run to supply electric current, but it frees the main engines entirely from the work of driving the scavenging-pumps, thus increasing the horse-power actually delivered to the shaft. The main crank-shaft is also shorter than it would otherwise be, as no cranks are necessary for the scavenging pumps, and the space required for the engines is thereby much reduced. Both these points are of great advantage in the case of the larger marine-engines which will be required in the near future as the motorship becomes more and more generally adopted.

### SWEDISH FARMERS' MOTORSHIP "ARATOR"

Reference has previously been made in these pages to the new motorship "Arator" of the Svenska Landtmannens Rederiaktiebolaget (Swedish Farmers Shipping Co.), Stockholm, recently completed at the Kockums Mek Verkstads (Kockums Shipyard), Malmo, Sweden, and Diesel powered by Burmeister and Wain, Copenhagen, Denmark. We are now enabled to give more complete specifications of this vessel as follows:

Displacement (Loaded) . . . . . 10,400 tons
Displacement (Light) . . . . . 2,865 tons
Total cargo cubic-capacity . . . . 403,592 cub. ft.
Dead-weight-capacity of Ship . . . . . 7,535 tons

(*Continued on Next Page*)



**Crankshaft of a 6-cylinder Sulzer two-cycle Diesel marine-engine of 3,500 shaft h.p. now under construction at the plant of Sulzer-Freres, Winterthur, Switzerland**

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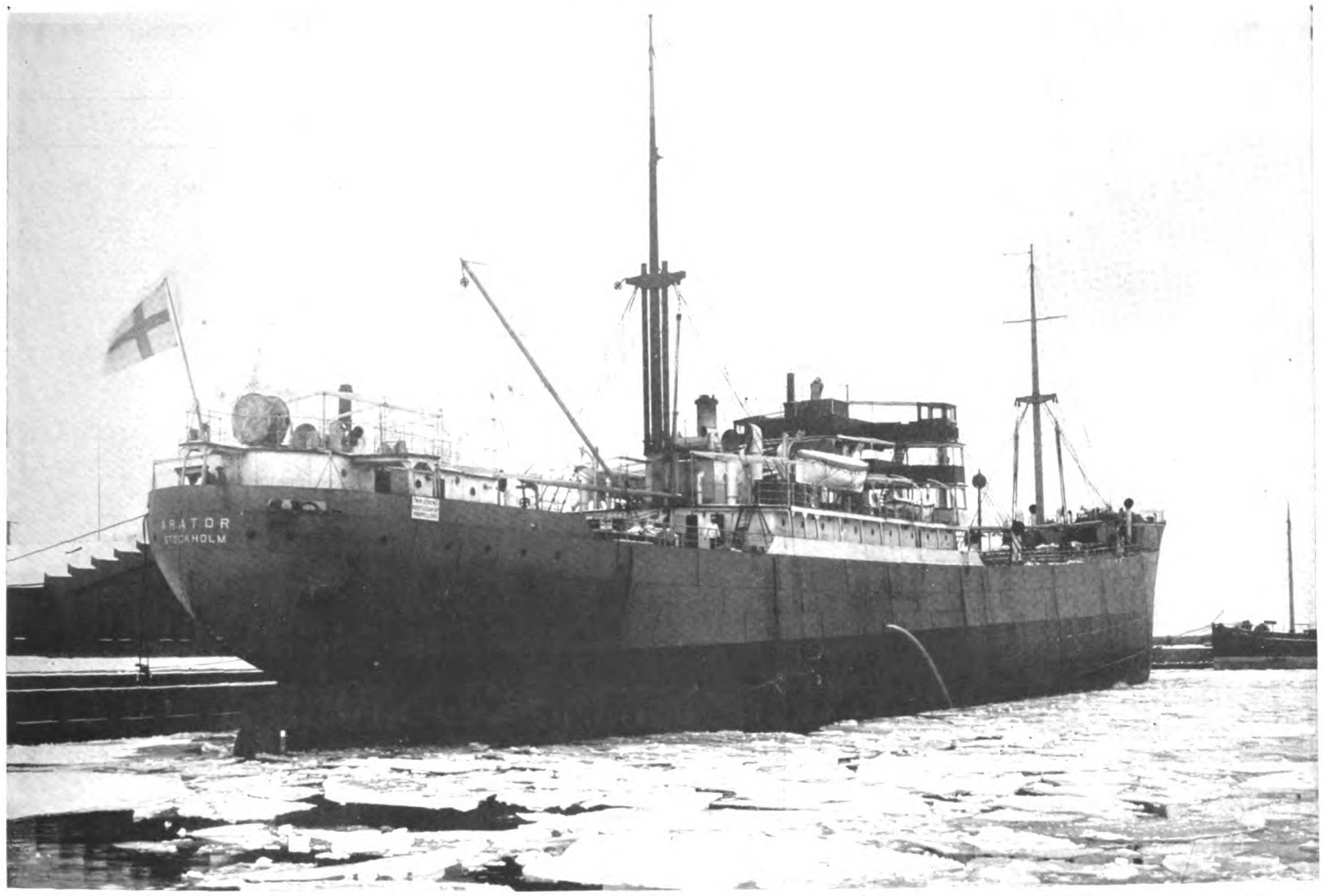



**Swedish Farmers new Diesel-driven motorship "Arator," just prior to leaving the harbor at Malmo, on her maiden voyage, Feb. 2, 1922**

389,500 cub. ft. grain, 371,200 cub. ft. bales and 7,100 cub. ft. in open forecastle.

Cubic-capacity of Deep-Tank in after hold (liquid or dry cargo) . 2 x 3,496 cub. ft.

Weight capacity of Deep-Tank . . . . 2 x 92 tons

Capacity of Fuel-bunkers (double-bottom) . . . . . 1,044 tons

Total Fresh-water Carried . . . . . 87 tons

Cruising Radius . . . . . about 36,000 Naut. miles

Class and Society . . . . . Brit. Lloyd, 100 A. 1

Length (O. A.) . . . . . 381′ 3″

Length (B. P.) . . . . . 367′ 0″

Breadth (Moulded) . . . . . 51′ 3″

Loaded Draught (Mean) . . . . . 24′ 8½″

Indicated Horse-power . . . . . 2,100

Engine Speed . . . . . Rev. per minute, 150

Ship's Speed (Loaded) . . . . . about 10½ knots

Propeller, Dia., Pitch and Area . . . . . Twin screw: 10′ 10″ diam. x 8′ 0″ pitch

Daily Fuel-Consumption . . . . . about 8 tons

No. of Engine-room Staff . . . . . 13

Type of Diesel Engines . . . . . Four-cycle type, 6 cyls.

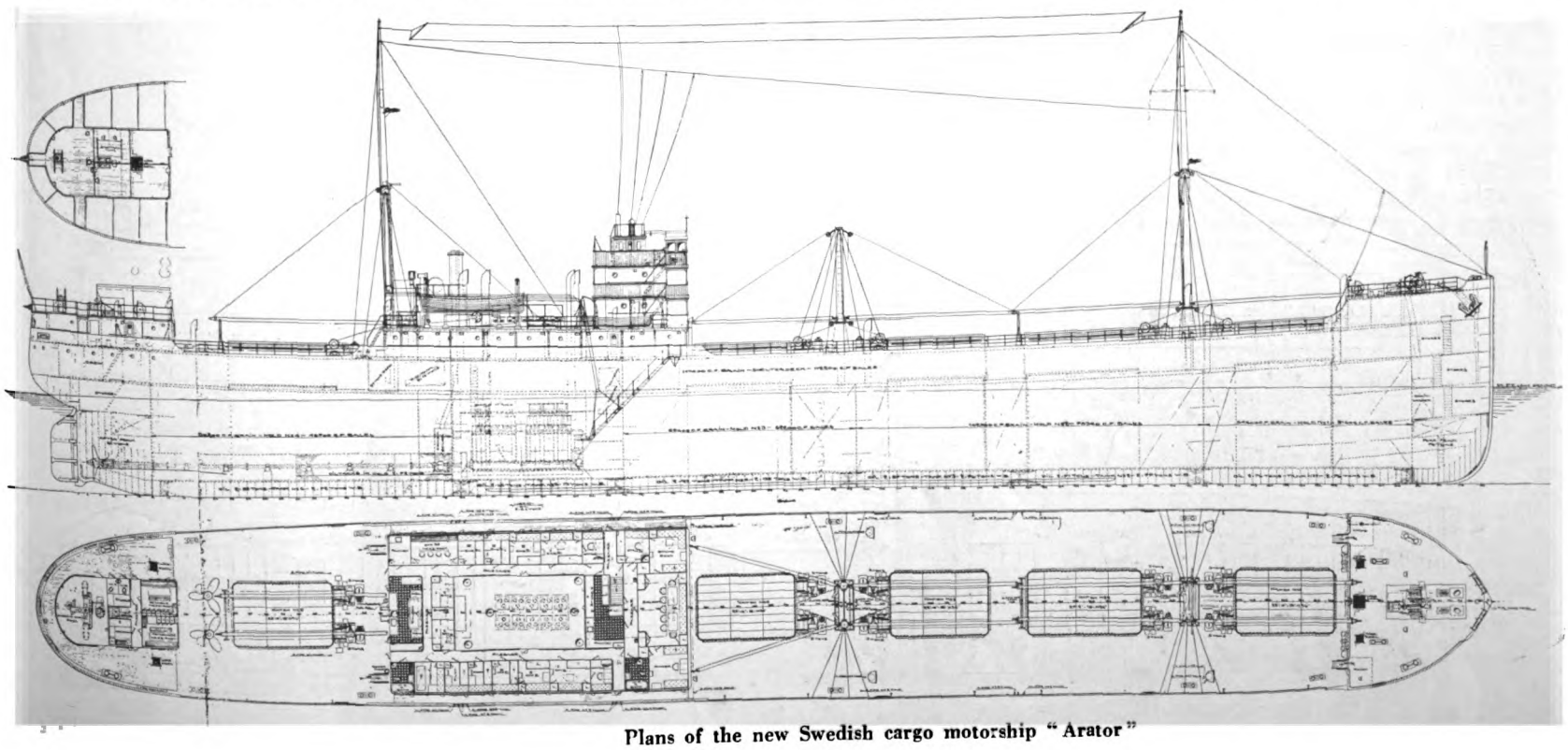
Cylinder Bore and Stroke. 540 m/m x 730 m/m

Area of heating-surface of donkey-boiler . . . . . 100 sq. ft.

Length of Machinery Space . . . . . 43′ 9″ (+ 8′ 4″ recess for donkey-boiler)

Date put in Service . . . . . 3 Feb., 1922

The vessel is provided with two complete steel decks, open forecastle and large midship deck-houses. Two steel masts and twin derrick posts. Ten steel cargo derricks of 5 tons capacity each, worked by ten 3-ton electric winches, supplied by "Allmänna Svenska Elektriska Aktiebolaget, Västeras, Sweden. Electric - hydraulic steering - machinery of Brown, Brothers' & Co., Ltd., Edinburgh, make. Electric windlass supplied by Helsingborgs Varvs Aktiebolag, Helsingborg. Electric-light throughout, and wireless installation.



**Plans of the new Swedish cargo motorship "Arator"**

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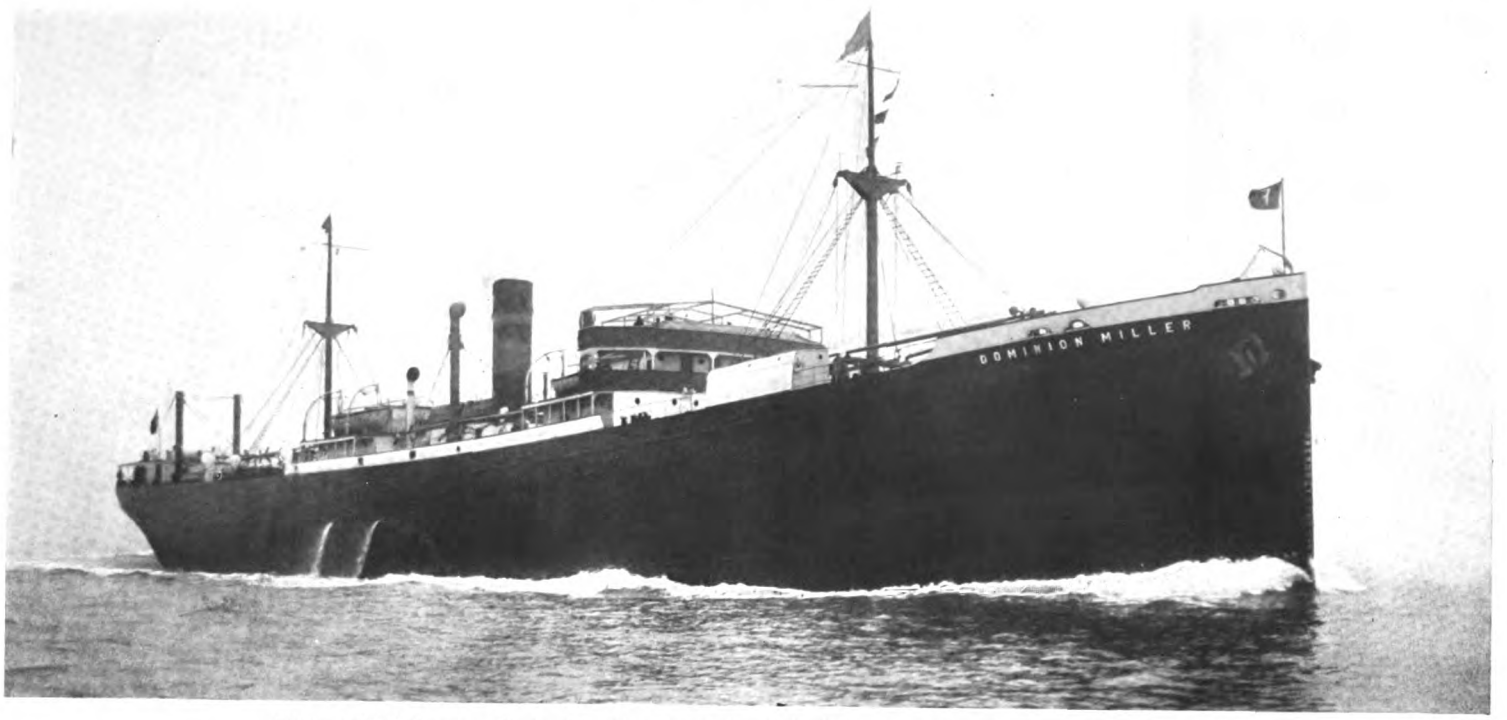



**Furness-Withy's new Doxford-built and engined single-screw motorship "Dominion Miller"**

# Trials of the Doxford Motorship "Dominion Miller"

***Most Complete Details Yet Published of the Sea-Tests of Furness Withy's New Single-Screw Opposed Piston Oil-Engined Freighter***

WHEN some few months ago the Doxford engine motorship "Yngaren" set off on her maiden voyage, the incident represented the realization of one of the most ambitious aims which any firm of ship or engine builders has ever had in view. To carry through a design which necessitates the scrapping of conventional marine practice required courage and confidence, to say nothing of the financial strain, which is worthy of the greatest admiration.

The first trip of the "Yngaren" afforded both builders and owners an opportunity to decide on any alterations which might be deemed advisable with the "Dominion Miller." However, apart from a few minor details not noticeable to the average observer, an inspection of her engine set reveals no modifications. Amongst the minor alterations we have a slightly simplified camshaft drive for the port and starboard camshaft. Also the auxiliary fuel-pump, the circulating, lubricating and other similar auxiliaries are all steam-driven, the main reason being that the owners of the vessel preferred steam driven deck machinery.

Full particulars of the engine have already been published in the MOTORSHIP and in last month's issue particulars of the successful bench trial were published. Incidentally reference was made in the latter case to some of the important details of the engine.

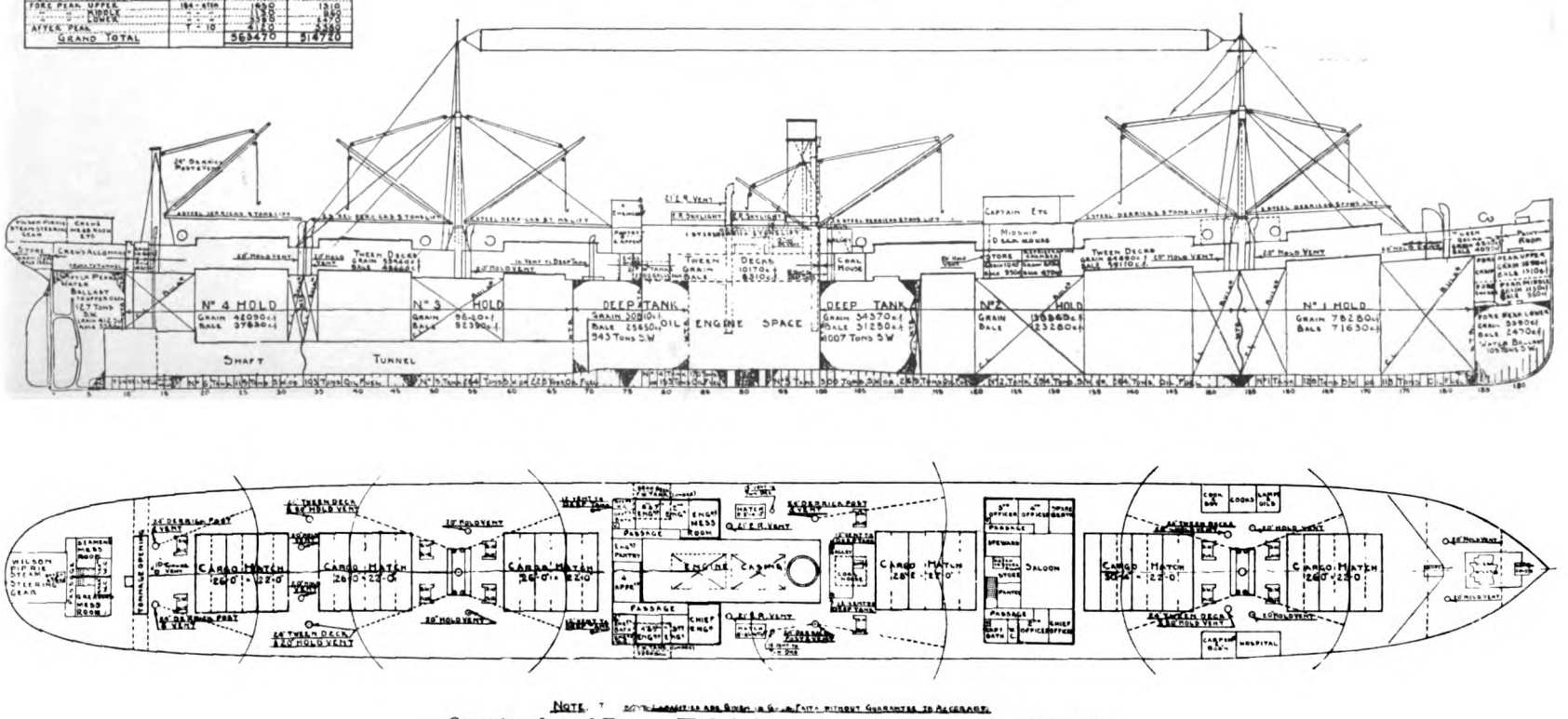
The "Dominion Miller" was built and engined by Doxford & Sons, Ltd., Sunderland, for Messrs. Furness, Withy & Co., Ltd., under the direction of the owners' marine superintendent, Mr. E. W. Harvey.

In the following table the principal dimensions are recorded:—

| | |
|---|---|
| Length B. P. | 420 ft. |
| Breadth Ex. | 54 ft. |
| Depth Mld. | 29 ft. upper deck |
| Gross Tonnage | 5089 tons |
| Net Tonnage | 3142 tons |
| Displacement | 6840 tons |
| Water Ballast and Jacket Water | 2182 tons |
| Fuel Oil Bunker | 1132 tons |
| Hold Capacity: | |
| Grain | 563,470 cu.ft. |
| Bale | 514,720 cu.ft. |
| Speed | 12 Knots |

The general arrangement plan of the vessel shows two holds forward and two aft, the engine being amidships. The machinery consists of one 4-cylinder Doxford opposed-piston oil-engine 580 m.m. (22¾" bore x 1,160 m.m. (45½") stroke, rated at 3,000 I.H.P. at her designed speed of 77 revolutions per minute. The propeller is of solid bronze, having the following dimensions: Diameter, 17′ 3″;

| CAPACITY OF HOLDS | FRAMES | GRAIN CUBE | BALE CUB. F. |
|---|---|---|---|
| No. 1 HOLD | 114 - 164 | 78280 | 71630 |
| No. 2 HOLD | 114 - 154 | 130060 | 112180 |
| DEEP TANK FORE | 105 - 115 | 34370 | 31280 |
| " AFT | 87 - 93 | 34370 | 31280 |
| No. 3 HOLD | 33 - 46 | 98150 | 82390 |
| No. 4 HOLD | 10 - 33 | 92730 | 37830 |
| TOTAL HOLDS | | 472510 | 381830 |
| SHELTER TWEEN DECKS | C - 1 | 1760 | 1260 |
| " " " | 1 - 13 | 1460 | 1210 |
| " " " | 93 - 77 | 52860 | 43640 |
| " " " | 77 - 100 | 10170 | 8310 |
| " " " | 100 - 123 | 64090 | 53115 |
| " " " | 123 - 154 | 4840 | 4000 |
| STORE ROOM | 114 - 154 | 1240 | 800 |
| REFRIGERATING CHAMBER | 126 - 131 | 810 | 870 |
| TOTAL HOLDS & TWEEN DECKS | | 553130 | 506600 |
| FORE PEAK UPPER | 164 - 176 | 600 | 1210 |
| " MIDDLE | " " | 1330 | 850 |
| " LOWER | " " | 1330 | 470 |
| AFTER PEAK | 7 - 10 | 5140 | 5390 |
| GRAND TOTAL | | 563470 | 514720 |




**Capacity-plan of Furness-Withy's Motor Freighter "Dominion Miller"**

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pitch, 16′ 6″; with a surface area of 94 sq. ft.

The steam-boilers on board are of the Cochran type, there being two, fitted respectively on the port and starboard side of the forward bulkhead in the engine-room. The boilers are 8 ft. diameter x 16′ 6″ high, have oil-firing equipment fitted and work at 100 lbs. per sq. in. normal pressure.

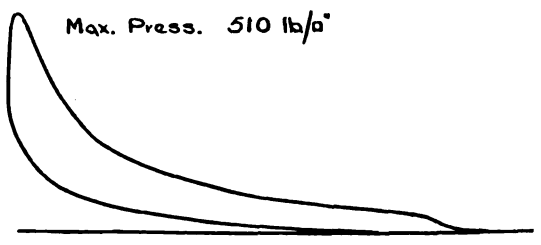
The sea trials were held off the Tyne and proved very satisfactory. The vessel was, of course, light, but with water and oil-fuel ballast a reasonable draft was obtained.

| | |
|---|---|
| Draft (forward) | 9′ 10″ |
| Draft (aft) | 18′ 11″ |
| Draft (mean) | 14′ 4½″ |
| High Water at Sunderland | 5.41 a.m. |
| Barometer | 29.74″ |
| State of Sea | Smooth |
| State of Wind | Light Southerly |

The records of the trial are appended herewith:

| | |
|---|---|
| I. H. P. | 2920 |
| Revolutions per min. | 75 |
| Mean Indicated Pressure: | |
| Cylinder No. 1 | 100 lbs. per sq. in. |
| Cylinder No. 2 | 103 lbs. per sq. in. |
| Cylinder No. 3 | 97 lbs. per sq. in. |
| Cylinder No. 4 | 105 lbs. per sq. in. |
| Maximum Pressure: | |
| Cylinder No. 1 | 510 lbs. per sq. in. |
| Cylinder No. 2 | 525 lbs. per sq. in. |
| Cylinder No. 3 | 500 lbs. per sq. in. |
| Cylinder No. 4 | 530 lbs. per sq. in. |
| Fuel-Pump Pressure: | |
| Cylinder No. 1 | 10500 lbs. per sq. in. |
| Cylinder No. 2 | 11000 lbs. per sq. in. |
| Cylinder No. 3 | 10100 lbs. per sq. in. |
| Cylinder No. 4 | 11050 lbs. per sq. in. |
| Fuel-Pump Control Setting (Maximum 300) | 230 |
| Sea Temperature | 40°F. |
| Water-Circulating Temperatures from piston and jackets | 161°F. (mean) |
| Water-Circulating Pressure | 19 lbs. per sq. in. |
| Lubricating-Oil Temperature | 75°F. |
| Lubricating-Oil Pressure | 14 lbs. per sq. in. |
| Scavenging Pressure | 2 1/16 lbs. per sq. in. |
| Exhaust-Gas Temperature: | |
| Cylinder No. 1 | 532°F. |
| Cylinder No. 2 | 575°F. |
| Cylinder No. 3 | 525°F. |
| Cylinder No. 4 | 580°F. |
| Exhaust-Gas Color | Clear |
| Donkey-Boiler: | |
| Port Boiler Steam Pressure | 100 lbs. per sq. in. |
| Starboard Boiler Steam Pressure | 98 lbs. per sq. in. |
| Oil-Fired Gear: | |
| Pump Pressure | 100 lbs. per sq. in. |
| Oil Temperature (at burner) | 175°F. |

The trial proved satisfactory in every respect, the speed being 11.3 knots on No. 1 North run and 13.1 on No. 2 South run, giving an average mean speed of 12.2 knots, a highly creditable performance. On completion of the trials the vessel left the Tyne for Southampton, the last home port prior to the vessel leaving on her maiden voyage to Buenos Aires. On the run from the Tyne to Southampton the average conditions were noted and are recorded in the following table:




**Indicator-card taken on trial run of the Dominion Miller**

| | |
|---|---|
| I. H. P. | 2370 |
| Revolutions per min. | 69 |
| Indicated Mean-Effective Pressure | 87.5 lbs. per sq. in. |
| Fuel-Injection Pressure | 7000 lbs. per sq. in. |
| Water-Circulating Outlet Temperature | 160°F. |
| Lubricating-Oil Pressure | 13 lbs. per sq. in. |
| Scavenging-Air Pressure | 2.2 lbs. per sq. in. |

The engine behaved excellently and the maneuvering-gear both leaving and entering port proved its high degree of reliability, so effectively demonstrated already during the sea trials. The voyage round the coast was made in clear weather, hence no opportunity was available to study the effect of the Aspinall governor, the satisfactory behaviour of which under bench test conditions was referred to in last month's issue of Motorship. The fuel used during the sea trials was Diesel grade of specific gravity 0.895. This fuel will be the standard for the first few voyages until the crew has become fully accustomed to the working of the engine.

It is the intention to put the engine to a practical test to prove the claims of the builders—so clearly demonstrated during the bench tests—that the engine can run equally satisfactorily on a wide range of fuels, including British-standard grade boiler-fuel. With this object in view arrangements are in hand to change in due course from the Diesel grade to a light-grade boiler fuel and eventually to a standard grade boiler fuel.

We do not anticipate any reason why there should be any departure from this proposed programme and hence there is a dual interest in watching the records of this vessel, which may form a further step in the progressive development of the marine oil engine.

At the trials of the new motorship Dominion Miller, Eric Harvey stated the success of the Doxford engine was due to the engine-builders, and certainly was confident of success. So far as he could gather, access had already been attained by the first vessel fitted with the engine, the Yngaren. From the laying of the bed-plate to the present time there had been no trouble whatever, and he believed there was a great future for the Doxford engine.

K. O. Kener, chief of Doxford's engineering department, said that he had every confidence in the complete success of the new vessel. The first vessel had been a great success with the Doxford engine, despite the fact that it was an absolutely new and novel design.

The Dominion Miller is of 9,500 tons deadweight and of 3,000 i.h.p. and is to be operated between the United States and the United Kingdom by the Norfolk and North American Steamship Co. under the management of Furness Withy & Co.

### SUN SHIPBUILDING COMPANY TO BUILD DOXFORD DIESEL-ENGINES

We are now enabled to release the information that the Sun Shipbuilding Company of Chester, Pa., has purchased the Opposed-Piston Oil Engine Co., owners of the American Junkers patents, and have entered into a license arrangement with Wm. Doxford & Sons of Sunderland, England, to build the Doxford Opposed-Piston type and Diesel-engine. This makes the Sun Shipbuilding Company sole licensees for the Doxford & Junkers patents in the United States. An office has been opened in the Cunard Bldg., 25 Broadway, N. Y. C., and the company is now prepared to build and re-engine cargo-vessels with Doxford heavy-oil engines for operation on regular boiler oil. This is the firm of prominent East Coast shipbuilders to whom we referred on page 187 of our March issue, and in previous numbers. An immediate start is to be made on the construction of a four-cylinder 3,000 h.p. single-screw Diesel installation of the Sun-Doxford design.

### COMM. ERNEST NIBBS ON DIESEL-ENGINES

The Society of Automotive Engineers, at its meeting on Feb. 21st in New York, was favored with a paper on Diesel-engines by Commander Ernest Nibbs, Chief Engineer of the New London Ship and Engine Co., Groton, Conn. Tracing the development of fuels for automotive machinery, Commander Nibbs pointed out that the engine operating on the heavier oils is the only type of internal-combustion engine that can be certain of a future supply of fuel at a reasonable cost. The demand for gasoline and kerosene being so great, in view of automobile, tractor, industrial and household requirements, tends to keep the price high because of the well-known fact that only a small quantity of these fuels is refined as compared to the crude-oil which remains. There is a field for the development of a heavy-oil engine for use in trucks, tractors and work-boats in order to release gasoline for automobiles and aeroplanes, thus restoring balance in the petroleum industry.

Such an engine must be of reasonable weight, easily started, flexible and not of prohibitive cost. These requirements necessitate efficient atomization at all speeds, materials to stand high temperature and pressures and reliable starting arrangements. The difficulties encountered, according to Commander Nibbs, are (a) control of detonation, (b) obtaining of flexibility at varying loads and revolutions, (c) simplicity of fuel-injection device and (d) obtaining certain ignition upon fuel being injected at low revolutions. As regards materials, it is his opinion that marked progress would be made if more attention were paid to foundry work, stating that all foundries that successfully make castings for Diesel-engines can supply those for steam-engines, but the reverse is not true. It is his impression that steel-castings of German manufacture are superior to those made outside of Germany, but we would call particular attention to the fine steel-castings produced by the U. S. Navy referred to in our March issue. Commander Nibbs advocates annealing all castings having to withstand high temperatures and pressures.

As regards starting, he believes that electric heating-coil for use during the first few revolutions is preferable to blow lamps or air starting for small units, although the latter is permissible for work-boats where air is used for the whistle. Running small oil-engines at warmer temperatures is also recommended. In conclusion, Commander Nibbs states: "Under present conditions and design, the limits of power per cylinder cannot be increased to any great extent, consideration of heat stresses, thickness of walls to withstand pressures and at the same time transmit away unused and for the time being unwanted heat, limit the cylinder diameters that are possible. Obviously, there is a limit to the length of the engine so that cylinders on one shaft cannot be increased in numbers indefinitely. Therefore, we are forced to consider other directions in which to expand, and these appear to be:—two-cycle single-acting and then two-cycle double-acting; development after that will depend on metals and design that can successfully cope with higher M.E.P. than is in use today and this must be done without adversely affecting reliability."

### INTERNAL COMBUSTION ENGINE FUNDAMENTALS

At a meeting of the Institute of Marine Engineers in London in April last a paper was read by I. I. Fasola upon the fundamentals of hot-bulb marine engines which has just been published in the Transactions of the Institute. A 100-120 brake h.p. Avance hot-bulb oil-engine installed in a towing barge is the subject of the author's investigations. Mr. Fasola's studies in the thermo-dynamics and principles of operation of the hot-bulb engine resulted in the evolution of a table of fundamentals of applied mechanics and thermo-dynamics. These formulæ should prove of help to the engineer interested in the design of this type of engine.

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# Holland-America Line's Motorship "Dinteldyk" Delivered

ON February 10th, the first of the fleet of 14,000-ton motorships building by Harland & Wolff for the Holland-America Line was delivered. This is the "Dinteldyk," one of a series of six large and swift freighters that will form an express service by this Dutch company in conjunction with the Royal Mail Steam Packet Co., whose first sister motorship, the "Loch Katrine," is already in service, between the Pacific Coast and Europe, three Diesel-vessels being constructed for each company. All will have refrigerator space for fruit carrying.

These vessels will be "of the most modern, the most economical and of the most efficient type" as is possible to construct to-day, and there cannot be any question but that it will be impossible for American *steamers* to successfully compete against them, although the cost of these British and Dutch ships is fairly high because of the very high-grade construction, finish and equipment.

***One of Six 14,000 Tons Diesel-Driven Vessels That Will Compete Directly Against American Steamers***

For instance, these ships will average twelve and one-half to thirteen and one-half knots speed at sea on a daily oil-fuel consumption less than the amount of fuel-oil needed to operate the steam-winches and ship's auxiliaries of a similar-sized steamer when in port, or about twenty tons. When the "Dinteldyk" is in port, she will operate her thirty-six electrically-driven cargo-winches on less than two tons of oil per day, including one forty-ton derrick and a twenty-tonner, or about one-tenth of the quantity necessary to produce steam for steam-winches. She will carry a crew of about eighty men and elaborate accommodation for twelve passengers, including saloon and smokeroom. The net-cargo capacity, without including fuel, water and stores, will be nearly 13,000 tons. Fuel oil is carried in the double bottoms.

The principal dimensions of the "Dinteldyk" are as follows:

| | |
|---|---|
| Deadweight capacity | 14,000 tons |
| Gross Tonnage | 9,500 tons |
| Power | 6,000 to 6,400 i.h.p. |
| Daily Fuel Consumption | 20 to 22 tons |
| Length O. A. | 502′ 0″ |
| Breadth | 62′ 0″ |
| Depth | 38′ 6″ |
| Classification | Lloyds 100 A1 |

In the engine-room there are two eight-cylinder, four-cycle type Harland & Wolff B. & W. Diesel propelling-engines, each having an output of 3,000 i.h.p. at 115 R.P.M. or 6,400 i.h.p. at 125 R.P.M. They are single-acting and are direct reversible. Then there are four H. & W. standard type Diesel-driven 100 K. W. 220-volt electric generating-sets for providing power for all the auxiliary machinery of the engine-room, deck and ship's general purposes. A Harland & Wolff electric steering-gear is installed, also a powerful wireless outfit.

# Tankers Ltd. Fourth Motorship Launched

SINCE the war Vickers, Ltd., have launched six standard Diesel-driven tankers of about 14,000 tons loaded displacement each, and during the war they built or engined several motor-tankers, including the Asiatic Petroleum Co.'s "Marinula," ex "Santa Margherita," of 14,750 tons displacement and 2,500 shaft h.p., and the "Trefoil" and "Olympia" of 4,000 tons displacement and 1,500 shaft h. p. In addition nearly a dozen iron and steel sailing ships of fair tonnage have been converted to full-powered tankers, and equipped with twin Vickers 800 shaft h.p. high-speed Diesel engines. So Vickers, Ltd., now have about twenty motorships to their credit in addition to hundreds of submarines. Two 14,000 tons displacement Vickers Diesel-tankers are owned by the Anglo-American Oil Co., namely the "Narragansett" and "Seminole."

Recently the fourth sister motor-tanker for Tankers, Ltd., of London was launched at Vickers' Barrow yard, namely the "Scottish Musician." The other three are named "Scottish Maiden," "Scottish Minstrel" and "Scottish Standard." She has the following dimensions:

| | |
|---|---|
| Displacement | 14,200 tons |
| Deadweight Capacity | 9,800 tons |
| Length O. A. | 441′ 6″ |
| Length B. P. | 425′ 0″ |
| Breadth (Extreme) | 56′ 10½″ |
| Breadth M. D. | 56′ 8″ |
| Depth M. D. | 33′ 0″ |
| Speed | 10½ knots |
| Power | 2,500 shaft h.p. |
| Classification Lloyds | 100 A1 |
| System of Hull Construction, | Isherwood Longitudinal |
| Daily Fuel Consumption | 9½ tons |

The propelling machinery consists of twin Vickers six-cylinder 1,250 shaft h.p. airless-injection Diesel oil-engines, 24½″ bore by 39″ stroke turning at 118 R.P.M.

### Design of the Engine

The main distinctive feature of the Vickers engine, as compared with usual Diesel practice, is the abolition of the injection air-compressor, the fuel being injected by means of an oil-fuel main, supplied by a four-barrel pump situated on one of the main columns from which smaller pipes lead to each spray-

***"Scottish Musician," Another Vickers Diesel-Engined Tanker, Takes the Water***

valve through screw-down valves. Compressed-air is provided for starting and reversing only, the starting-air pressure required being 600 pounds.

Two steam-driven air-compressors are fitted to provide starting-air, either of which is fully capable of dealing adequately with all requirements, even for the most prolonged and intricate maneuvring such as is necessary in canal navigation.

The engine frame consists of a cast-iron bed-plate, upon which are mounted eight cast-iron columns of trestle form, which span the main bearings. Between them, on the starting platform side, are the guides, water-cooled on the ahead side, while the crosshead is of the single-slipper marine type. Cylinders are cast separately, but bolted to one another at their lower ends, forming a deep, rigid entablature from which long tie-bolts pass to the bedplate and relieve the columns of all tensile stresses. The camshaft; operated by spur and bevel gearing, is situated above the columns, the cam-levers being mounted on a fulcrum-shaft above the camshaft, which arrangement provides for the whole of the valve-operating mechanism being visible and readily accessible from the upper grating.

### Interlocking of Controls

Reversing is carried out by means of an air servo-motor situated between the centre cylinders, while a device for interlocking the reversing lever with the starting-air and speed control levers prevents reversal unless the engine has come to a full stop. Conversely, by the same arrangement, the engine cannot be started unless the reversing-gear is either in the "ahead" or "astern" position.

Complete engine-control is effected by a simple arrangement of four hand-levers at the engine bedplate level. The reversing-lever being in its correct position, the operation of the second lever admits air to the starting valves, and as soon as the engine is moving freely on air the spray-valves are put into action by means of the third lever, the second (air) lever being replaced, leaving the engine running on fuel only. The fourth lever is for emergency use only, and kept locked save when reversing by hand. In each cylinder-head, in addition to the starting and relief valves, is one exhaust, one inlet, and one fuel-spray valve, the inlet and exhaust valves (the latter water-cooled) being of nickel steel.

### Steam for Cargo-Pumps and Heating-Coils

The vessel carries three steam reciprocating pumps for cargo handling, each capable of delivering about 300 tons of oil per hour, the deck delivery-pipe line being fitted with numerous connections so that shore attachments may be arranged without loss of time. the whole of the pipe system, both in the tanks and on deck, having been designed with this object in view. A noteworthy feature of the vessel is the installation of steam heating-coils on a generous scale in the cargo tanks and bunkers for the purpose of reducing the viscosity of thick oils to a consistency at which the pumps can handle the cargo expeditiously. Steam for this purpose is provided by two watertube oil-fired boilers situated above the engine-room, which also provides steam for auxiliary machinery and for "steaming-out" the cargo tanks.

### Utilizing Exhaust-Gases of Main Engine

A feature of these boilers is the fact that, in addition to the oil-fired furnaces, provision is made for utilizing the waste-gases from the main propelling-engines for raising and maintaining steam pressure. Two steam-driven dynamos of 50 k.w. each supply the required lighting current, and also power for a bilge pump, a refrigerator water supply pump, a $CO_2$ refrigerator compressor, and a motor for engineers' workshop. The steering gear is of the Vickers electro-hydraulic single-tiller type, situated on the upper deck aft, with telemotor bridge control.

The ship's equipment includes a steam-capstan on the forecastle and three steam-winches, two on the upper deck for working derricks and one on the poop for warping purposes. The ship is provided with a 1½ k.w. wireless installation, the operating room being situated on the flying bridge.

### NORWAY NOW HAS 1,503 MOTOR-VESSELS

There are now registered in Norway no fewer than 1,503 motorships and oil-engined work-boats aggregating 223,547 tons gross. In 1914 there were only 209 craft of that type.

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# Motor-Tugs versus Steam-Tugs

## *Some Factors Affecting Selection of Power for Tug-Boats*

By H. CAREL SNETHLAGE*

IN making a comparison between internal-combustion engines and steam-installations for small boats like tugs, water-boats, supply-boats, etc., it is usually made on the basis of considering the two installations to be of the same power and installed in the same size boat. It is often considered that, as the first cost of a Diesel-engine is slightly higher than that of a steam-engine with boiler and auxiliaries and the cost of the hull in such a case would be the same, that the interest on the capital investment and the depreciation are higher for the Diesel-boat. This is often considered to partly offset the lower cost of operation, especially in the smaller craft.

This, however, is not a fair comparison because one of the principal assets of the oil-engine is that it weighs considerably less and occupies less space than a steam-installation. With engines up to 400 h.p. per unit, where a surface-ignition oil-engine can be used this difference in weight is even more pronounced than in the larger powers where a Diesel-engine is the power selected. This means that in the case of a tug-boat the motor requires a smaller hull, or in the case of a vessel carrying cargo, more deadweight can be carried on the same displacement.

In order to demonstrate this difference, a comparison was made between steam and motor power for a small harbor-tug of about 220 B.H.P. or 280 I.H.P., as shown in the arrangement plans. The same relation holds good for larger tugs for coast or ocean service, with the difference that instead of a surface-ignition oil-engine, as used on the smaller boat, a Diesel-engine would probably be selected. The Diesel-engine is somewhat heavier than the former, takes up a little more room but has a lower fuel-consumption and would be the proper engine for installations over 400 horsepower per engine.

For the surface-ignition oil-engine tug the weight figures out as follows:

| | | |
|---|---|---|
| Surface-ignition engine, 220 B.H.P. (280 I.H.P.), including air-tanks, air-starting outfit, etc..... | weight | 15.5 tons |
| Fuel-oil for 100 hours use (the engine consumes 0.50 lb. per B.H.P.)..... | " | 5 " |
| Auxiliaries, tanks and piping | " | 9 " |
| Propeller (7 ft. dia.), shaft and fittings ..... | " | 4 " |
| Fresh-water 1 ton (the engine works without water-injection) ..... | " | 1 " |
| Stores and miscl..... | " | 7 " |
| Total ..... | | 41.5 tons |

The weight of hull and outfit would be $L \times B \times H \times 12.8$ lbs. = 43 tons. The total displacement figures at 85 tons with a block coefficient of 0.50.

This gives a boat the following dimensions: 60′-0″ × 15′-3″ × 8′-3″ × 6′-6″.

The crew consists of captain, engineer, deck-hand and cook.

For a steam-tug of the same horse power, the weight would be: Total machinery (I.H.P. × 440 lbs.) 55 tons, divided as follows (to which is added other weights):

| | |
|---|---|
| Boiler (11 ft. dia., 8 ft. long, two furnaces 145 lbs. pressure)..... | 22 tons |
| Water in boiler ..... | 9 " |
| Engine, 280 I.H.P., 135 revolutions per minute ..... | 11 " |
| Auxiliaries, incl. fresh-water tanks and piping ..... | 9 " |
| Propeller (8 ft. dia.) and shaft..... | 4 " |
| Fuel for 100 hours, oil-fired boiler in side bunkers (7 frame spaces) alongside of boiler..... | 13 " |
| Fresh water in tank in for'd part of engine-room ..... | 5 " |
| Stores and misc..... | 7 " |
| Total ..... | 80 tons |

The weight of hull and outfit would be $L \times B \times H \times 12.4$ lbs = 83 tons. The total displacement figures at 163 tons with a block coefficient of 0.50.

This gives a boat of the following dimensions: 75′-0″ × 19′-0″ × 10′-6″ × 8′-0″.

The crew consists of captain, engineer, fireman, deck-hand and cook. From the arrangement plans can be seen that there is no trouble in getting the accommodations in the size of boats mentioned and that the boats would be on an even trim under all conditions.

An objection might be raised here because the oil-engine is of 240 revs. per minute and the steam-engine 135. As the motor-tug is smaller and has a 7 ft. wheel, this gives a good propeller efficiency at 240 revs., whereas the 8 ft. wheel of the steam-tug is at its best around 135 rev. The only difference would be that the steam-tug with its larger propeller would be a little quicker in starting. In case it would be preferred to have them both at the same number of revolutions a reduction-gear could be installed by offsetting the motor from the center and bringing the air tanks and auxiliaries over to the other side. According to information received a 2 to 1 gear for this power and number of revolutions (reducing from 240 to 120 revs.) would weigh about 800 lbs. with dimensions 3 ft. by 2 ft. and cost less than $2,000. As there is ample room aft of the engine for such a gear and a little more slope to the keel would give more draft at the stern for a larger propeller it can be seen that this addition would not materially change the proposition. As far as known, motor-tugs operating at 240 revs. per minute, without reduction gear, have given no trouble.

In making a comparison of first-cost and operating expenses the following approximate figures can be used:

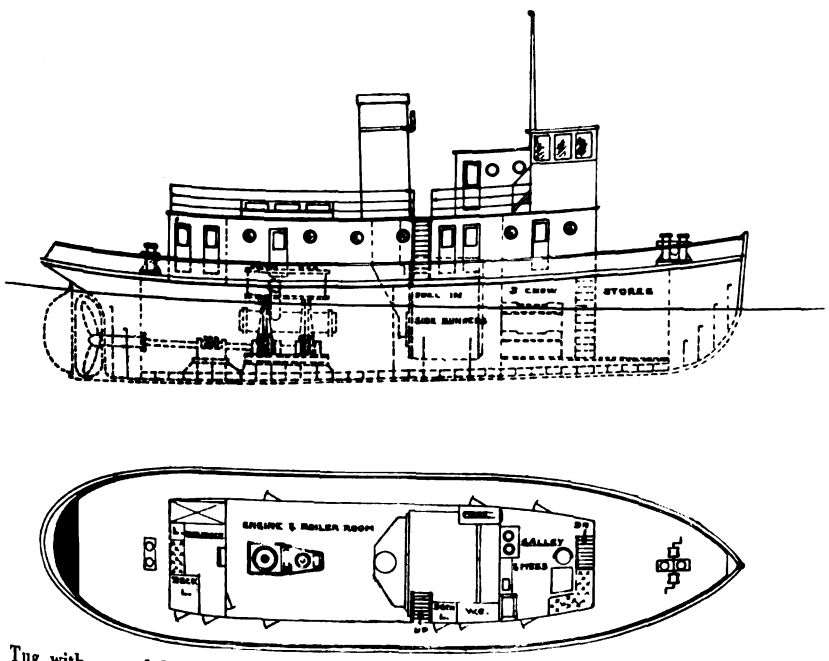
The first cost of the steam-tug of 280 I.H.P. would be about $64,000 and of the motor-tug of 220 B.H.P. (280 I.H.P.) $47,000. Figuring interest on capital at 5% and depreciation at 5%, total 10%, this would give an annual saving of $1,700 for the motor vessel.

In operating expenses the surface-ignition oil-engine uses about 0.5 lb. per B.H.P. or 0.4 lb. per I.H.P. as against 1.25 lbs. per I.H.P. for the steam-engine. The fuel used in the oil-engine is mostly Diesel-oil (though the modern engines working without water-injection can use heavier oils) whereas the steam-engine uses the ordinary heavy boiler fuel-oil. Taking the price of the fuel respectively at 7 cts. per gallon of Diesel-oil and 4 cts. per gallon for fuel-oil and figuring 7.57 lbs. to the gallon for Diesel-oil and 7.86 lbs. to the gallon for fuel-oil, the cost per I.H.P. hour would be: For the oil-engine, 0.37 cts. per I.H.P. hour; for the oil-fired steam-outfit, 0.635 cts. per I.H.P. hour.

The difference therefore would be 0.265 cts. per I.H.P. hour, or for 280 I.H.P. on an 8-hour working-day and 300 working-days a year it would mean an annual saving of $1,780.

There are other important savings, as for instance, the wages of the fireman, the stand-by losses, which especially in work around the harbor are considerable, etc., but the main points are the different size of boat for the same power and the lower fuel-consumption.

*Member of the firm of Christensen & Snethlage, naval-architects, New York City.




Tug with wasteful steam-plant, occupying large amount of space and weighing much more than a Diesel engine

Motor-Tug referred to in Mr. Snethlage's article. Note space saving over the steam-tug

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# Interesting Notes and News from Everywhere

### DIESEL YACHT FOR GREAT LAKES

A 180 H.P. Nelseco Diesel-engine has been sold to a prominent Chicago yachtsman for installation in an auxiliary sailing yacht now building for service on the Great Lakes.

### NEWFOUNDLAND TO PAY BIG SUBSIDY

On all commercial vessels from 25 to 50 tons built in Newfoundland and ready for sea by July 1st the Newfoundland Government will pay a subsidy of $30 per ton, provided the hulls were laid down since October 14th last.

### NEW MOTORSHIP SERVICE

A new ship line known as the Pacific Commerce & Trading Co. of Los Angeles, Cal., is to start a service between Los Angeles Harbor and ports on the West Coast of Central America. Two ships will be used in this service. The General-Manager is A. C. Hinsdale.

### MISSISSIPPI RIVER COMMISSION BOAT

On page 117 of our February issue and on page 200 of our March issue we referred to a new vessel now under construction for the Mississippi River Commission. Two 60 h.p. Mianus oil-engines have been purchased for installation in this craft.

### WERKSPOOR-ENGINED MOTORSHIP "RHEA" LAUNCHED

Recently the Lobith Shipbuilding Company launched the single-screw Werkspoor Diesel-engined, 2,250 tons deadweight cargo motorship "Rhea," building to the order of the Netherlands Steamship Co. of Rotterdam, Holland.

### DIESEL-DRIVEN BOAT FOR JOHN RINGLING

Now being built by the Consolidated Shipbuilding Company from designs by Henry Gielow to the order of John Ringling, the circus magnate, is a boat in which two 180 b.h.p. Nelseco Diesel-engines will be installed. One of these engines was on exhibition at the recent New York Motorboat Show.

### MAIDEN VOYAGE OF MOTORSHIP "LEISE MAERSK"

The new single-screw Diesel-driven motorship "Leise Maersk" arrived at Java after having averaged a speed of 10 knots on a consumption of 4,600 kilos of oil per 24 hour day. She is completing her voyage around the world, returning via the Panama Canal.

### NORTH GERMAN LLOYD'S MOTORSHIP PROGRAMME

It is proposed to equip several of the company's new vessels with Diesel-engines, said Privy-Councillor Stimming, Chairman of the Norddeutscher Lloyd, at the recent general meeting. Later, he continued, we shall try out Diesel-engines in one of our passenger-liners.

### LAUNCH OF MOTORSHIP "TROLLEHOLM"

Recently the 7,500 tons d.w.c. cargo motorship "Trolleholm" was launched from the Kockums shipyard, Malmo, Sweden. She has been built to the order of the Swedish-American-Mexico Line of Göteborg. She is the second Diesel-driven ship launched from the Kockums Yard and is practically a sister-vessel to the Swedish Farmers Co.'s motorship "Arator." The owner of the "Trolleholm" is one of the Dan Brostrom shipping companies. Both the Kockum-built vessels are somewhat similar to the Johnson Line motorships, but have greater deadweight-capacity because they are built as closed shelter deckers and have smaller and lower powered machinery. Like the "Arator" the "Trolleholm" will have her Diesel-engines installed at the Burmeister & Wain plant in Denmark.

### MORE ITALIAN MOTORSHIPS

In our issue of March 1922 on page 197 was given an illustration of the Roma Navigation Company's new motorship "Vejo," an Ansaldo-San-Giorgio built and Diesel-engined vessel of 8,400 tons deadweight. Two more Ansaldo-San-Giorgio motorships are under construction for the same company. One of these, the "Faleria" is a sister freighter to the "Vejo," while the third craft is the tanker "Lanuvio," which is of an entirely new type, and of 8,300 tons deadweight. All three vessels are twin-screw propelled by two 1,100 b.h.p. Ansaldo-San-Giorgio two-cycle Diesel-engines turning at 110 R. P. M. The "Lanuvio" is being constructed on the transverse system to the Registro Navale Italiano and to the British Corporation.

### MOTORSHIPS BUILDING IN GERMANY FOR NORWEGIAN OWNERS

The Deutsche Werft at Hamburg, which is building motorships with Diesel-engines of the A.E.G.-B & U four-cycle type, has booked an order for three twin-screw motor-freigters from the firm of Wilhelm Wilhelmsen of Christiania. Two of the ships will have a deadweight-capacity of 8,000 tons, and the third is to be of 8,800 tons. They are destined for the South American and Australian service, and will be fitted with refrigerator holds for loading frozen meat. This is the first large order going from Norway to Germany. Until now the owners have built in England, but Mr. Wilhelmsen has declared that with the present conditions it is impossible to build in England, as the hulls alone would be dearer than completely engined and outfitted ships in Germany.

### VOYAGE OF "WILLIAM PENN"

It may have been inferred from our last issue that the motorship "William Penn" stopped at Madras. As a matter of fact she actually made a non-stop run from Singapore to Suez, a distance of 5,000 nautical miles with the following results—

| | |
|---|---|
| Indicated horsepower main engines | 4,200 H.P. |
| Mean revolutions | 107.8 R.P.M |
| Fuel-consumption per 24 hours | 13.35 tons. |
| Average sea-speed | 11.48 knots |
| Mean draft | 21′ 3″ |

This gives an average fuel-oil consumption of 0.297 lb. per i.h.p. hour for the main engines and for all purposes. The "William Penn" arrived in London on February 12th and was due to proceed to Amsterdam, Hamburg and Liverpool, thence to the United States. She is due to arrive at New York just as we close for press, so a complete story on her round-the-world performance will appear in the next issue of MOTORSHIP, and will include figures showing an operating economy, reliability and speed that steamship owners will find difficulty in believing.

### VANDERBILT PURCHASES WORLD'S LARGEST DIESEL-YACHT

Very shortly the world's largest Diesel-driven yacht will appear in American waters – this being the "Ara" originally built in England for Mons Heriot of Paris, but turned over upon completion to the French Admiralty for use as a submarine-patrol vessel, when she was fitted with two 6″ guns. The builders were Camper-Nicholson of Southampton, and she was designed by C. E. Nicholson, who designed the "Shamrock IV." She is propelled by twin Polar Diesel-engines of the six-cylinder, two-cycle type, each having an output of 825 shaft h.p. at 165 R.P.M., the working cylinders being 450 mm. bore (17.716″) by 540 mm. stroke (21.259″). On tests in the shop the total shaft h.p. developed was 1,535 h.p., with a fuel-consumption of 0.477 lb. per b.h.p. hour. The weight of the two engines together, including thrust-blocks, fly-wheel, air-bottles, silencers and filters, piping, tools and spare parts, etc., is 184 tons. The "Ara" has the following dimensions:

| | |
|---|---|
| Length o.a. | 215′ 0″ |
| Length b.p. | 195′ 0″ |
| Breadth | 31′ 2″ |
| Draft | 13′ 2″ |
| Displacement (as a yacht) | 850 tons |
| Displacement (as a war-vessel) | 1,236 tons |
| Speed (as a war-vessel) | 14 knots |
| Date placed in service | June, 1919 |

For auxiliary purposes there is a 25 b.h.p. two-cylinder Polar Diesel-engine coupled to a compressor and dynamo. This engine runs at 550 R.P.M. The main engines were built by the Atlas Diesel Motorer of Stockholm, Sweden, and are of the stepped-piston type, with scavenging-pumps arranged directly below the main working-piston, thus providing a scavenging-pump for each cylinder, with a separate piston and piston-rod coupled in tandom with the working-piston, the suction and discharge of the air taking place on the underside of the piston. The latter also acts as an air-engine for starting and maneuvering, compressed air being admitted below the piston at 50 to 100 lbs. per square-inch instead of the regular scavenging-air when the maneuvering function is being performed. An illustration of the "Aba" in her war paint appeared in MOTORSHIP of December, 1919.

### BIG EARNINGS OF AMERICAN SHIPYARD

The New York Shipbuilding Corporation's annual report shows net income of $2,046,559 saved from gross income of $4,899,671, and, after payment of $800,000 in dividends, a surplus of $1,246,559. In 1920 the company's gross income amounted to $4,398,759; net, $2,395,402; surplus, $1,595,402.

The company had a surplus of $4,218,078 at the beginning of 1921, so with the $1,246,559 surplus accrued the surplus at the end of the year was $5,464,637. This was subject to liability for Federal income and profits taxes accrued to December 31, 1921. The Federal taxes, which were paid, were applied against the year in which they accrued.

In the company's balance sheet property and plant are valued at $15,951,536; production work in progress is put at $180,841,290, compared with $152,382,182 at the end of 1920, and total current assets at $7,924,300, against $6,184,059. Total liabilities were $630,979, against $3,035,954.

Outstanding items in the report are given in the following comparative table:

| | 1921 | 1920 |
|---|---|---|
| Gross income | $4,899,671 | $4,389,759 |
| Net income | 2,046,559 | 2,395,402 |
| Surplus for year | 1,246,559 | 1,595,402 |
| Surp. at beginning of yr. | 4,218,078 | 2,622,675 |
| Surplus at end of year | 5,464,637 | 4,218,078 |

The company is now engaged in the construction of a 2,000-horsepower Werkspoor Diesel-engine for cargo-ship purposes, for which $200,000 has been appropriated.

In his remarks to the stockholders, President Marvin A. Neeland said:

"The combined output for Government and private accounts during 1921 totaled twenty-three vessels of 206,888 gross tons, a record which, considering the variety of the specialized tonnage produced, has never been approached by any other American shipyard.

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### TESTING DIESEL ENGINES

Before the North East Coast Institution of Shipbuilders and Engineers, England, Mr. J. C. Arthur read a paper on the Testing of Diesel Engines, on February 9th.

### MOTORSHIPS "LASSAL," "LEIGHTON" AND "LINNEL"

"Lassal," the third of the three cruiser-stern type 11,000 tons twin-screw deadweight motorships building for Lamport & Holt at A. McMillan's yard, Dumbarton, Scotland, is almost ready for launching. The other two are named "Leighton" and "Linnel." All three vessels are propelled by twin 1,400 shaft h.p. Harland & Wolff B. & W. Diesel engines.

### HIGH PRICE FOR MOTOR AUXILIARY "SCOTTISH GLEN"

The converted windjammer "Scottish Glen" built 37 years ago, and recently equipped with Swedish built Polar Diesel-engines of 360 b.h.p. each at the Vulcan Yard, Stettin, Germany, has been sold to Sigvald Rasmussen, Haugesund, Norway, for 8,400,000 marks. She has been classed 1A1 by the Norwegian Veritas. Her hold capacity is 182,445 cub. ft. of grain, or 168,170 cub. ft. of general cargo. Length O.A. 279' 6"; Breadth, 40' 3"; Depth, 27'.

### CHAIRMAN LASKER AND STEAMSHIP CONVERSION

In an official announcement issued to the press on March 8, Chairman A. D. Lasker of the U. S. Shipping Board said: "I will advocate that after determining what tonnage may be considered commercially practical we offer to American interests hulls for the installation of Diesel engines. The other tonnage, I think, should be sold abroad, with the proviso that it shall not engage in trade from American ports. The remaining ships should be dismantled."

### BETHLEHEM MOTORSHIP BUILDING

In several marine magazines statements have appeared that the Bethlehem Shipbuilding Co. will at once commence construction of about ten to fifteen million dollars' worth of marine Diesel-engines at its plants on the Pacific Coast. Mr. J. J. Tynan, vice-president and general-manager, denies authorizing any statement. Mr. Tynan expects that the Bethlehem plant in San Francisco will shortly build Diesel-engines, but no definite plan or type of engine has yet been decided upon.

### FRAMERICAN-SCHNEIDER BONDS

On March 13th, J. P. Morgan & Co. of New York offered an issue of $10,000,000 of 7½ per cent. bonds of the Framerican Industrial Development Corp., which is the American subsidiary of the well-known French steel company and Diesel engineers of Le Creusot and Le Harfleur, etc., France. For nearly three-quarters of a century their dividends have never been less than 11 per cent., except in 1871, when it was 7 per cent., and for the most has been 35 per cent. The Framerican Industrial Development Corp. are the exclusive U. S. representatives for the Schneider Diesel-engine. The entire bond issue was sold in 15 minutes.

### NEW NORWEGIAN SHIPYARD SUBSIDY FROM GOVERNMENT PROFIT ON MOTORSHIPS

As a consequence of freight depression and of the competition of German yards, the Norwegian yards are suffering severely from unemployment. To improve their desolate state a resolution has been passed, by which a sum of 14½ million kroner is to be devoted to procure employment to the yards. During the war, the Norwegian Government bought three single-screw motorships, operated them with success, and later sold them at a profit of 14½ million kroner to S. O. Stray & Co., of New York and Christiania. It is very probable that this sum will be applied to build some new motorships.

### DIESEL ENGINE FOR WOODEN HULL

It is proposed to instal a Diesel-engine in conjunction with a Kitchen reversing-rudder in a Ferris-type wooden hull at Seattle, Wash. The proposition is in the hands of Geo. E. Voorhees, Jr. of Santa Barbara, Calif.

### SINGLE-SCREW MOTORSHIP "JACOB MAERSK" LAUNCHED

The second large single-screw motorship has been launched from the Odense Yard, Denmark. She is the "Jacob Maersk," sister vessel to the "Leise Maersk," recently described in "Motorship." This vessel also has one of the new Burmeister & Wain long-stroke Diesel-engines installed.

### TRIAL TRIP OF DIESEL-ELECTRIC YACHT "ALCYONE"

As we close for press the sea trials of the three-masted schooner yacht "Alcyone," which has been converted from steam to Diesel-electric drive, are about to take place from Todd's Tebo Yacht Basin, Brooklyn, N. Y. We are unable, therefore, to give our readers a story of this interesting installation in this issue, but will do so in our May issue.

### HAMBURG-AMERICAN LINE'S MOTORSHIP FLEET

We have been given to understand that there are not ten motorships building for the Hamburg-American Line, but six vessels. Of these three steel vessels; namely the "Haveland," "Rhineland" and "Munsterland" have been constructed or are still building at the Blohm & Voss yard, Hamburg, while the other three motorships are building at the Deutsche Werft, Hamburg.

### WOODEN MOTOR-VESSEL "MOUNT BAKER" SOLD

Frank B. Peterson, the well-known salmon-packer of Bristol Bay, Alaska, and San Francisco, Calif., have purchased from Gaston, Williams & Wigmore the wooden motorship "Mount Baker" now at Houston, Texas. He will send her to San Francisco for use in connection with his canneries and as a freighter. It may be remembered that the "Mount Baker" was constructed at Portland, Oregon, in 1918 by the Supple-Ballin Shipbuilding Corp. and is of 4,700 tons d.w. or a capacity of nearly two-million ft. of lumber. She is propelled by twin Winton 500 shaft h.p. Diesel-engines, and has a speed of about 8 knots.

### PAPER ON DIESEL-ENGINE FLEXIBILITY

At Newcastle-on-Tyne, on Jan. 6th, W. S. Burn contributed to the meeting of the North-East Coast Institution of Engineers and Shipbuilders a paper on this subject. The author's conclusions are the result of long investigation of the Diesel-engine with a view to its application to locomotive drive on railways, where flexibility is an absolute essential. The desirability of flexibility in marine Diesel-engines is no less essential and the comprehensive discussion of the principles which govern flexibility as given in this paper should prove of the greatest interest to marine Diesel-engine designers and engineers. In view of the fact that Mr. Burn demonstrates that the flexible engine is also economical this question should further interest operators.

Mr. Burn designates the following requirements of marine-engine flexibility: (1) ability to vary the power and speed simultaneously, (2) the capability to maintain the minimum fuel-consumption at different speeds and different loads, (3) the ability to burn efficiently a wide range of fuels, and (4) the ability to start with a minimum of external power and to reverse readily. The production of igniting temperature is considered in relation to water circulation, shape of combustion-spaces, and compression, illustrated by cross-sections of various Diesel-engines. Types and forms of valves as affecting vaporization and ignition are discussed, as well as nozzles and atomizers. Scavenging and turbulence, control of valve lift and blast-air pressures are treated in an interesting manner and starting and reversing data obtained from many Diesel-engines in service are included. The paper is published in the Transactions of the above Institution under date of January, 1922, but just issued.

### MOTORSHIP CONSTRUCTION AT THE DUETSCHE WERFT

Among motorships now under construction at the Deutsche Werft, Hamburg, are two 4,500 tons cargo-vessels to the order of the Kosmos Steamship Company, Hamburg. Each of these boats will be fitted with an A. E. G.-B. & W. Diesel-engine of 1,700 h.p.

### DIESEL-ENGINE BUILDING IN GERMANY

According to the German shipping publication "Hansa," rapid progress has been made in the construction of Diesel-engines in Germany, and that since the war Diesel-engines for merchant ships have been constructed as follows:

| | | | | | |
|---|---|---|---|---|---|
| 3 | motors | of | 150-200 | effective | horse-power |
| 6 | " | " | 350-500 | " | " " |
| 2 | " | " | 950 | " | " " |
| 20 | " | " | 1,160 | " | " " |
| 4 | " | " | 1,600 | " | " " |
| 2 | " | " | 1,650 | " | " " |
| 4 | " | " | 1,750 | " | " " |
| 2 | " | " | 1,800 | " | " " |
| 2 | " | " | 2,600 | " | " " |
| 45 | motors | of | 53,600 | effective | horse-power |

In addition to these Diesel-engines built specially for merchant-ships, about 25 submarine motors of 150 to 950 effective h.p. were built into merchant-ships in the same period, and about 35 small crude-oil motors of 35 to 375 effective h.p.

### MORE CANAL MOTOR-VESSELS PLANNED

A proposal is now being made by the Central Steamship & Commerce Corp., 30 Broad Street, New York, to build 15 Diesel-Electric motorships of 1,300 h.p. from designs by Theodore Wells for service through the Welland and New York Barge Canals, between New York and Chicago. Two holds per ship will have refrigerating equipment. Length of ship, 257 ft. Breadth, 42 ft. Depth, 18 ft.

### RUMANIAN MOTOR GUNBOATS

The French Diesel-driven submarine-chasers "Chiffonne," "Friponne," "Impatiente," and "Mignonne," illustrated in our issue of December, 1919, have been sold to the Rumanian Navy. They are propelled by twin Sulzer, Diesel engines.

### VESSELS ENTERING PORT OF GOTEBORG

During 1921, a total of 3,349 merchant vessels entered the port of Göteborg, Sweden, comprising as follows—

| | |
|---|---|
| Steamers | 1,840 |
| Motorships | 1,298 |
| Sailing-ships and barges | 201 |

### RAYMOND E. LOVEKIN

The business of Raymond E. Lovekin, Advertising Engineer, 10 So. 18th Street, Philadelphia, Pa., has been incorporated under the name of Raymond E. Lovekin Corporation, but affairs will continue to be under the personal supervision of Mr. R. E. Lovekin as heretofore.

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# Our Readers' Opinion

*(The publication of letters does not necessarily imply Editorial endorsement of opinions expressed)*

### THE "UNRELIABILITY" OF MOTORSHIPS?

To the Editor of MOTORSHIP:

I have made some 8 to 10 voyages as one of the engineers on the wooden motorship "Lassen" from Northern Washington to Southern California and in that time we have never delayed a sailing, other than requiring fifteen minutes notice before the lines are thrown off. This time is necessary to heat the hot-heads on the engine—they being of the surface-ignition type. We have maneuvred with the ease of any steam lumber-carriers, and follow the same courses up and down the coast. This in bucking head winds, skims the reefs for days at a time, in such cases running inshore to avoid the weather as much as possible and thus making better time. We have only been bar-bound for one day.

In one instance we came in finding seven ships bar-bound. We loaded and departed leaving them and a few others waiting for the seas to quiet over the bar. Quite frequently we go over one or two miles ahead of six or seven others who let us try it first.

Work at sea has been negligible other than a stop of five minutes to change the pressure-valve or atomizer. Quite often we make a trip without a minute's delay of either engine and sometimes make a non-stop voyage. This means continuous running of both motors, both on the outward and return voyage. Once we stopped a little over an hour to change a hot-bulb. Once a year the boat has dockage and general overhauling. We work on the motors only when the ship is loading or discharging. The pistons are pulled once a year, but only one cylinder at a time, and there has never been a machine-shop aboard except at the last docking where the propellers were drawn and inspected.

Motorship "Lassen," BATTEY KING.
San Pedro, Calif.

[This wooden motor-vessel was described and illustrated on page 180 of our Mar., 1922, issue. She is of 700 tons gross and propelled by two 350 b.h.p. four-cylinder Skandia surface-ignition marine oil-engines of the two-cycle type. The bore is 420 mm. by 480 mm. stroke and they turn at 250 R.P.M.—EDITOR.]

### "MOTORSHIP" KEENLY READ IN HOLLAND

To the Editor of "MOTORSHIP":

Enclosed please find the names and addresses of eighteen new subscribers to your magazine, who are employees of this company. You will see from the number of interested people on this list how "Motorship" is appreciated, and we want to say that every new number is now going from hand to hand and everybody wants to have it first. Hoping the success of "Motorship" will give you every satisfaction. G. T. LUGT.

Nederlandsche Fabrik van Werktuigen.
en Spoorweg Materieel,
Amsterdam, Holland.

### VALUABLE TO DESIGNERS AND INTERESTING TO NON-TECHNICAL READERS

To the Editor of MOTORSHIP:

The purpose of these lines is to congratulate you upon the excellent magazine which you have developed. I look at it from a strictly technical point of view—being a designer—and wish to say that I do not know of any other commercial publication in this country of a similarly high scientific value in addition to the many features of general interest necessary to make it attractive to the non-technical reader. It appears to be quite out of keeping with the ordinary run of American journalism.

Chicago, Ill. CHAS. S. SALFELD.

### OIL-ENGINE NOMENCLATURE

To the Editor of "MOTORSHIP":

I note considerable discussion over the proper name to give to the injection of fuel without blast-air. Why not call it what it is "Direct injection?"

D. C CONKLING.

Balboa, C. Z.

### DIESEL-ENGINE EXHAUST-TEMPERATURES

To the Editor of MOTORSHIP:

In the February number of MOTORSHIP you publish a diagram giving the exhaust-gas temperatures under varying conditions of load for two and four cycle Diesel-engines. The diagram shows the four-cycle engine as having very much higher exhaust-temperatures than the two-cycle engine and consequently would point to the liability of trouble with the exhaust-valves of the former.

It is stated that these results were obtained from engines constructed by Sulzer Frères of Winterthur, who no doubt have published them to show the superiority of the two-cycle engine. While in no way disputing the results obtained by Sulzers from engines of their own make, I would point out that the high temperatures logged by them are not present in all four-cycle engines. This will be seen from the diagram herewith on which has been reproduced the curves for the Sulzer engines and in addition the exhaust-gas temperature readings recorded during exhaustive trials of a 1,250 B.H.P. Beardmore-Tosi 4-cycle marine type Diesel-engine.

Similar readings obtained during the trials of a 1,600 B.H.P. Nobel two-cycle engine are also given, the figures having been obtained from the published trial results. It will be noticed that the Beardmore-Tosi engine exhaust gas temperatures are far below the 4-cycle figures given by Sulzers. The trials of the Beardmore-Tosi engine and the Nobel 2-cycle engine were run at varying speeds, giving conditions approximating to these obtained on board ship.

In the Beardmore-Tosi 4-cycle engine the low exhaust-temperatures are due to the special type of valve-gear fitted. This gear utilizes the same valve for induction and exhaust, an oscillating flap-valve directing the exhaust-gases into the exhaust-pipe, and the cold induction-air into the cylinder. The valves are cooled by the incoming air immediately after each exhaust phase thus obviating the usual exhaust-valve troubles common to the ordinary 4-cycle engine. An additional advantage of the arrangement is the possibility of allowing exhaust-valve areas up to 75% in excess of those usually obtainable in the 4-cycle engine. ROBERT LOVE.

Chief-Designer,
Diesel-Engine Department,
W. Beardmore & Co., Ltd.,
Dalmuir, Scotland.

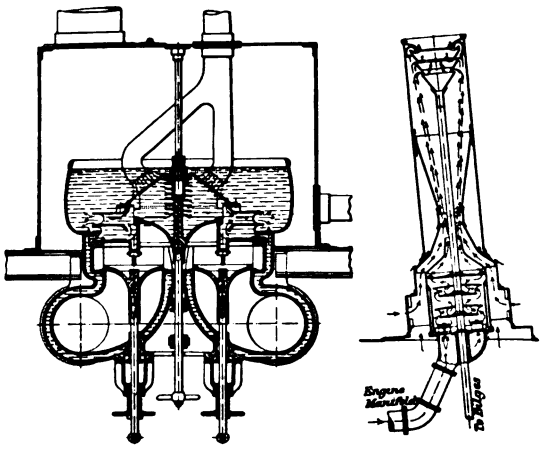
### VENTILATING AND SILENCING FOR MOTORSHIPS

To the Editor of MOTORSHIP:

Allow me first to wish you every success with your magazine in 1922. In my copy of the December issue of MOTORSHIP I read with great interest the report of the Swedish Civil-Engr., Hugo Moren, of his trip on a big motorship. On page 29 Mr. Moren refers to the ineffective air-circulation system of motor-rooms of motorships in warmer climates when 45 centigrade has been recorded, pointing out the great necessity of installing an efficient ventilating system. He proposes to instal 5 ft. pairs at various places. These, however, all require driving power, and constant attendance, lubrication and renewals, overloads, etc.

In these cases it seems to me that my air-cooled silencing and ventilating arrangement as shown and described on enclosed print would meet all these requirements in a far simpler, cheaper way.

The exhaust, after passing the spring-loaded valves of the silencer illustrated on the left hand side, enters an expansion box containing baffles. It then passes up into a combining tube, drawing with it a large quantity of cold air, and expanding again in the upper part of the funnel to practically atmospheric pressure. At the top of the funnel is arranged a set of funnel-shaped louvres terminating



at the down-turned cone apex in a pipe off to the bilge, to which any water caught on these baffles is drained. This pipe serves to support the baffles in the expansion box at the base of the funnel. The lower part of the combining cone may be extended to the deck and put in communication with the engine-room when effective means of withdrawing the hot gases from the latter results. This type of exhaust has been working satisfactorily on twin-screw vessels of 1,500 brake horsepower, and has also been installed on 3-1,200 B.H.P. Diesel-engines in a shipyard power-house with very good results.

c/o Fredk. A. Pullen & Co., W. H. MARTIN.
Empire Works,
Vauxhall, London, F. E. 11, England.

### THE MOTORSHIP ENGINEER QUESTION

To the Editor of "MOTORSHIP":

The writer would very much like to ask you a few questions if it is not a burden for you to reply.

(1) Are all the American motorships in operation or tied up?

(2) Are Diesel marine engineers plentiful or scarce? I mean with good experience, and license for large ships.

(3) Are any Diesel engineers' jobs open at present and do you receive inquiries for any through your office?

My reason for asking is this: Since I came out of the Navy, where I was a Chief Petty-Officer in the engine-room of a coast-patrol vessel, I have been unable to locate a job as engineer of a Diesel or semi-Diesel driven vessel and I hold a Chief-Engineer's license of any gross tons for motorships, have had seven years' experience in the building, operation and erection of such engines but have not been able to connect with any line or company or manufacturers of Diesel engines, and have written to a dozen or more. Now what could be the reason unless there are more engineers than jobs? (I mean good engineers.)

Trusting you could be of service to me in locating a position on some motor-vessel or ship (American), inland or ocean going,

ALFRED B. KREST.

Norfolk, Va.

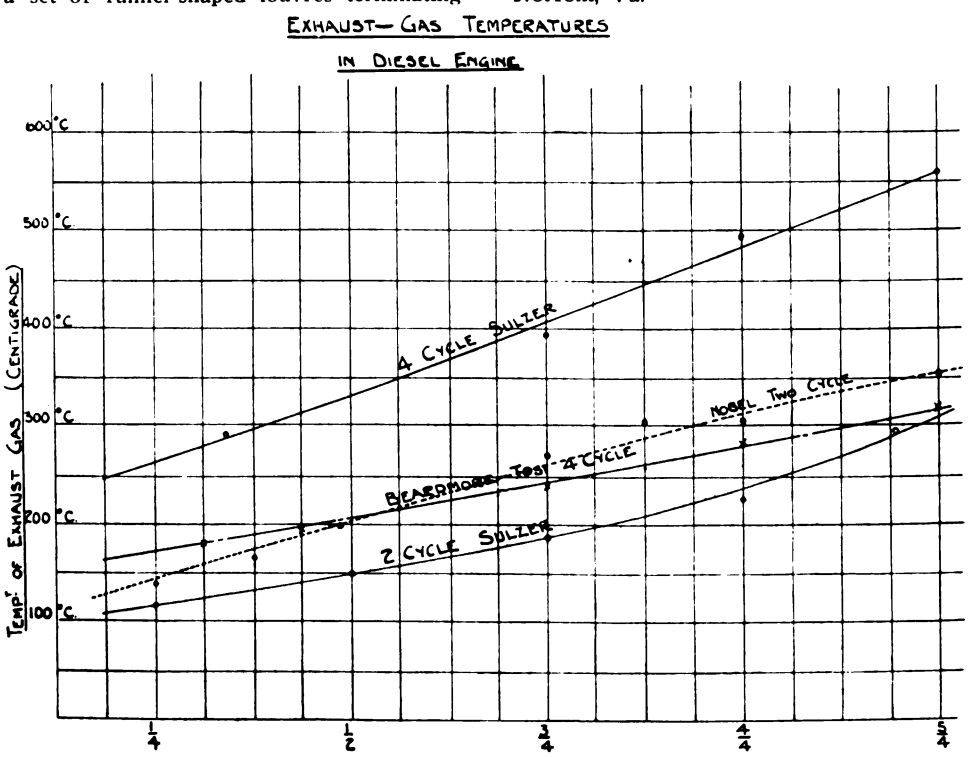



**Diagram accompanying Mr. Love's letter**

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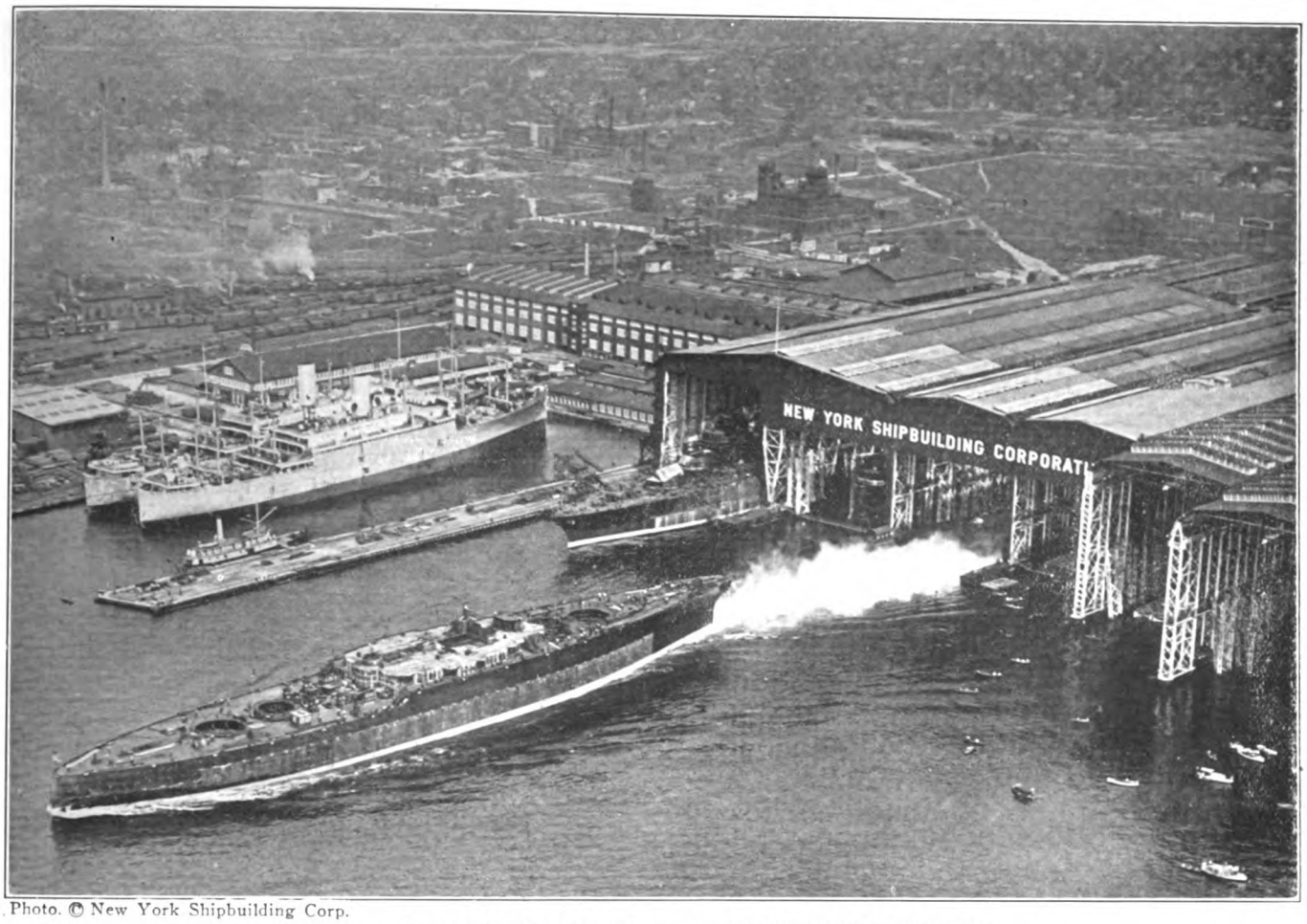


Photo. © New York Shipbuilding Corp.

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